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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 56652 - 57509.

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MAY 1976

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Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

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Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

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Odors and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:113, $3.00.

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Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts, May 1972, GPO No. EP 4.9:105, $2.00.

Hydrochloric Acid and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:100, $0.55.

Chlorine and Air Pollution: An Annotated Bibliography, July 1971, GPO No. EP 4.9:99, $0.55.

Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

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Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

Asbestos and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:82, $0.50.

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SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1976

56652 **APTIC NO. 81196**

Gspan, Primoz and Edvard Cadez

THE RATIO OF TOTAL VS. FINE DUST CONCENTRATION AT SOME TYPICAL DUST SOURCES AT WORKING PLACES. *(Das Verhaeltnis der Gesamt-zur Feinstaubkonzentration bei einigen typischen Staubquellen an Arbeitspaetzen). Text in German. Staub, Reinhaltung Luft, 36(1):11-13, Jan. 1976. 5 refs.*

Systematic measurements of the ratio of the total gas concentration to the respirable dust concentration were made for a series of typical operations in the wood industry, metal industry, textile industry accumulator industry, rubber industry, and pharmaceutical industry. A ratio of 3 to 1 has sometimes been used to express the relation of total gas concentration to respirable dust in formulating threshhold values for air quality standards, but in practice at the workplace this ratio may vary greatly. The personal sampler manufactured by Casella was used for sampling with and without preliminary separation of the respirable dust. Values for the ratio ranged from 1 to 100.

56653 **APTIC NO. 81197**

Reisner, Manfred and Hans Breuer

FUNDAMENTALS OF THE MEASUREMENT AND EVALUATION OF FINE DUST IN HARD COAL MINING. *(Grundlagen fuer die Messung und Bewertung des Feinstaubes im Steinkohlenbergbau). Text in German. Staub, Reinhaltung Luft, 36(1):1-5, Jan. 1976. 30 refs.*

The MAC values for quartz-containing respirable dust and quartz respirable dust as long-time values for an exposure to dust of 5 years in coal mines are based on epidemiological investigations. The specific pathogenicity of dust, besides the ash and quartz content, is a function of the age and rank of the seams. The use of cumulative dust values can compensate for the uncertainty of random sampling. Measurements of the deposition of dust particles of different sizes in the alveolar range of the lung permit a more exact definition of the noxious portion of the dust than does the Johannesburg method.

56654 **APTIC NO. 81625**

Yan, Chiou-shuang J.

EVALUATING ENVIRONMENTAL IMPACTS OF STACK GAS DESULFURIZATION PROCESSES. *Environ. Sci. Technol., 10(1):54-58, Jan. 1976. 11 refs.*

The environmental impact of the five most advanced and promising stack gas desulfurization processes, namely, limestone slurry scrubbing, lime slurry scrubbing, magnesia slurry scrubbing with regeneration to sulfuric acid, sodium solution with sulfur dioxide reduction to sulfur, and catalytic oxidation have been examined. Various kinds of wastes are formed in these desulfurization processes; the lime slurry scrubbing generates the greatest quantity while the catalytic oxidation the least. An attempt was made to assess the external costs of these control processes which could serve as an additional criterion for selecting control processes. The limestone slurry scrubbing process is the best choice when operating cost is the sole criterion. However, given the marketability of the resultant sulfuric acid, the catalytic oxidation process emerges as the best process when external costs are added to the operating cost. (Author abstract)

1975

56655 **APTIC NO. 81419**

Adams, J. A. S., L. L. Lundell, and M. S. M. Mantovani

WOOD VERSUS FOSSIL FUEL FOR EXCESS CARBON DIOXIDE. *Science, 190(4220):1154, Dec. 19, 1975. 3 refs.*

The environmental effects of burning wood versus fossil fuel are described. Wood burning releases a large amount of carbon dioxide into the atmosphere. It is estimated that 1.1 metric ton of wood are burned/capita/yr in Thailand. Deforestation for lumber and urbanization have the additive effect of destroying the photosynthesizing organisms that transfer atmospheric CO2 back into the cellulose reservoir. The inflow and outflow into the cellulose reservoir during the last century is difficult to estimate. A rapidly expanding human population burns cellulose much faster than it is being formed and held in living trees. The effects on the atmosphere of burning fossil fuel are documented, but the wood burning contribution to the atmospheric excess of CO2 is more difficult to document because the cellulose reservoir has a radiocarbon/carbon ratio only a few percent different from that of the atmosphere.

56656 **APTIC NO. 73811**

Aoyama, Hyogoro

ANALYSIS OF AUTO EXHAUST GASES. *(Jidosha haigau no bunseki). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 12(6):46, Feb. 1975. 20 refs.*

Analysis of auto exhaust gas is reviewed including analytical methods for carbon dioxide, carbon monoxide, hydrocarbons, nitric oxide, nitrogen dioxide, and aldehydes. The required features of the analytical method for auto exhaust gases are rapid analysis, the possibility of continuous analysis, high sensitivity, and few interferences by other compounds. The nondispersive infrared technique can be used for the above pollutants except for aldehydes and the technique can be improved by employing suitable interference filters. Gas chromatography is also used except for nitrogen oxide analysis and it gives the least interference among available analytical methods. The sensitivty of the GC method is satisfactory for most pollutants; however, the method cannot be used for continuous analysis. The currently available continuous analytical methods are NDIR for CO2, CO, hydrocarbons, and NO, non-dispersive ultraviolet for NO2, chemiluminescence for NOx, and flame ionization for hydrocarbons. No continuous aldehyde analytical method has been established yet. Non-continuous techniques are GC for CO2, CO, hydrocarbons, and aldehyde, infrared absorption for CO2, CO, hydrocarbons, and NOx, and wet methods which vary depending upon pollutants. By combining two or more analytical methods, interference problems can be considerably reduced.

56657 **APTIC NO. 81030**

Block, C.

DETERMINATION OF LEAD IN COAL AND COAL ASHES BY FLAMELESS ATOMIC ABSORPTION SPECTROMETRY. *Anal. Chim. Acta, 80(2):369-373, Dec. 1975. 18 refs.*

The determination of lead in coal and coal ashes by flameless atomic absorption spectrometry was investigated. Ten coal samples (from different Belgian mines) and their respective ashes were analyzed. Lead concentrations were found in the 7-110 micorgram/g range. The Pb concentrations in home heating and coking coal were 5-10 times lower than those in power station coal. The Pb content of the coal ashes was independent of the ash content; the highest concentrations were encountered in low-ash coals. The Pb concentration in fly ash, collected in a large combustion facility burning low ash coal, was also determined. A mean value of 1520 microgram Pb/g was found for six samples (range 1170-1810 microgram/g). Coal is an important source of toxic Pb.

56658 **APTIC NO. 81169**

Brakhnova, I. T. and S. A. Mosendz

COMPARATIVE HEALTH ASSESSMENT OF POWDER-FILLED WIRES EMPLOYED FOR SURFACING. *Weld. Prod., 22(2):78-80, 1975. 5 refs.*

The gross emissions of dust and gases formed during surfacing with the powder filled wires used in the welding industry were determined for PP-AN-124, PP-AN-125, PP-AN-G13N4, and PP-AN-170. Fluorides, carbon monoxide, oxides of nitrogen, and ozone form during surfacing with all wires. Dust emission is greatest when surfacing with PP-AN-124. The highest emission of fluoride occurs in surfacing with PP-AN-G13N4. Large quantities of CO form especially with PP-AN-124 and PP-AN-G13N4. Up to 60% of the aerosol component is in the form of carbides of manganese, iron, silicon, and chromium. Changes in the choline esterase activity in the liver and kidney are most pronounced in animals under the action of aerosols from surfacing wires PP-AN-G13N4 and PP-AN-124. Wire grades PP-AN-125 and PN-AN-170 have the least health hazards.

56659 **APTIC NO. 81706**

Brubaker, Paul E., John P. Moran, Kenneth Bridbord, and F. Gordon Hueter

NOBLE METALS: A TOXICOLOGICAL APPRAISAL OF POTENTIAL NEW ENVIRONMENTAL CONTAMINANTS. *Environ. Health Perspect., vol. 10:39-56, April 1975. 108 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

The public health benefits exepcted by reducing known hazardous emissions from mobile sources should not be compromised by increasing levels of other potentially hazardous unregulated emissions. The use of catalytic converters on light-duty motor vehicles may represent a source of new environmental agents of broad distribution potential, the attrition products of platinum-group metals. Preliminary experimental evidence and analysis of the impact of these control devices on the future use and demand for platinum indicates that this metal may appear at detectable levels in the environment by the end of this decade. At the present time, platinum and palladium are not present in the public environment and represent potentially new environmental contaminants as a consequence of use of this new abatement control technology. There is relatively little information available to adequately assess the potential health hazards that may be associated with exposure to these metals and their compounds. Analysis of the environmental problems and concerns associated with possible new environmental contaminants are discussed. Limited estimates are made of community exposure by use of a meteorological dispersion model. (Author abstract modified)

56660 **APTIC NO. 78473**

Cawse, P. A.

ANOMALOUS HIGH CONCENTRATIONS OF PARTICULATE BROMINE IN THE ATMOSPHERE OF THE UK. *Chemosphere, 4(2):107-112, April 1975. 9 refs.*

Concentrations of trace elements, including bromine, in air particulates were routinely measured since autumn 1971 at seven non-urban sites in the United Kingdom, from 51 to 60 deg north. Particulate Br concentrations were unusually high from December 1972 to March 1973, without elevated concentrations of other elements. To indicate if the maritime-derived aerosol and automobile emissions contributed mainly to the increased Br levels, ratios of Br to sodium and Br to lead in air particulate were normalized to the corresponding ratios in bulk seawater and ethyl fluid added to gasoline. Bromine to Pb concentrations in air particulate exceeded the ratio in ethyl fluid, while Br to Na ratios in air relative to seawater were also at a maximum. Other sources must account for the highest normalized ratios. No elevated chlorine to Na ratios were observed to suggest coal burning as a source. The possibility that analytical errors were responsible was disproved by analysis of air filters from a station at Pretoria, South Africa: normalized ratios showed no increase comparable with those for UK sites. A volcanic contribution to the higher particulate Br concentrations seemed likely, particularly as Heimay volcano in Iceland erupted in January 1973. The UK sites are adjacent to a narrow latitudinal belt of volcanic ejecta and gaseous effluent from 56 to 65 degrees north which includes the volcanoes of Kamchatka, the Aleutian Islands, Alaska, and Iceland. At these latitudes, such emissions to the troposphere would be transported in the general zonal circulation of westerly air streams.

56661 **APTIC NO. 81388**

Chollet, R., P. E. Pilet, W. Baehler, and G. Jaccard

ATMOSPHERIC POLLUTION, AUTOMOBILE TRAFFIC AND NATURAL PURIFICATION. *(Pollution atmospherique, trafic automobile et epuration naturelle). Text in French. Pollut. Atmos. (Paris), 17(65):1-8, Jan.-March 1975. 37 refs.*

A significant correlation exists between the density of automobile traffic and the degree of pollution from carbon monoxide and nitrogen dioxide. The correlation is highly variable and depends on the site and the measurement period. Pollution is lower during the day than at night especially when vegetation is present. The natural processes for eliminating atmospheric pollutants are discussing including physico-chemical and biological mechanisms.

56662 **APTIC NO. 81275**

Dini, J. W.

CHEMICAL MILLING. *Int. Met. Rev., vol. 20:29-55, March 1975. 191 refs.*

The environmental effects of chemical milling for fabricating metal parts are discussed. Fumes occurring during chemical milling consist of particulate matter which can be carried out of the tank as a liquid envelope of etching solution surrounding hydrogen gas or the vapors of the milling solution, such as sodium hydroxide, hydrogen chloride, and nitric acid, dissolved in water. These fumes are noxious and harmful to both animal and plant life and in some instances have corrosive effects upon structures and equipment. The growing concern of Federal and local governments with air pollution makes it likely that air pollution guidelines will be established for chemical milling. Air pollution restrictions force manufacturers into costly innovations that are reflected in the cost of milled parts. Strigent regulations force companies to leave densely populated areas and relocate to avoid the sharply rising costs associated with water disposal. Pollutant removing equipment presently available includes air washers, fume scrubbers, and wet collectors.

56663 **APTIC NO. 76764**

Eberan-Eberhorst, R.

VENTILATION OF ROAD TUNNELS WITH REFERENCE TO THE EXHAUST EMISSION OF TODAY S PASSENGER CARS. *(Anforderungen an die Belueftung der Strassentunnel in bezug auf die Abgasemis-*

sion heutiger Personenkraftwagen). Text in German. Automobiltech. Z. (Stuttgart), 77(6):169-176, 1975. 13 refs.

The specific exhaust emission (cu m/t km) of 58 passenger cars selected according to their frequency on the road were measured on the four-drum-testbench of the Technical University of Vienna at speeds from 40...80 km/hr and on simulated gradients up to 6%. The influence of altitude on carbon monoxide emissions for delta CO/1000 m equalled 2.1% vol. Engines with fuel injection showed no change in the dependence of exhaust CO-concentration on altitude. Constant speed gave the lowest CO emissions.

56664

APTIC NO. 81059

Fichtel, K.

LEACHING TESTS OF SLAGS AND FLYASHES FROM MUNICIPAL WASTE INCINERATORS - RESULTS AND RECOMMENDATIONS FOOR THE OPERATION OF INCINERATOR PLANTS AND THE TREATMENT OF RESIDUALS. *Bavarian State Office for Environmental Protection, Munich (West Germany). Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 366-368. (Nov. 3-5.)*

The composition of slag and flyash from incinerator residuals is described. Flyash separated by electrostatic filters should not be mixed with slag, but rather should be the object of an adequate separate treatment to lessen its extreme water solubility before use as landfill. Melting experiments on flyash and slag show that the necessary high temperatures cause the water soluble materials, especially chlorides and sulfates, to evaporate and thus contribute to air or water pollution. Dry separation of flyash from flue gases is preferable to wet scrubbing, to avoid surface water contamination by flyash salts.

56665

APTIC NO. 81704

Finklea, John F., John Moran, John H. Knelson, D. B. Turner, and L. E. Niemeyer

ESTIMATED CHANGES IN HUMAN EXPOSURE TO SUSPENDED SULFATE ATTRIBUTABLE TO EQUIPPING LIGHT-DUTY MOTOR VEHICLES WITH OXIDATION CATALYSTS. *Environ. Health Perspect., vol. 10:29-34, April 1975. 4 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

The potential environmental impact of equipping vehicles with oxidation catalysts was estimated. Three independent techniques were used to appraise community exposures. A carbon monoxide dispersion model was used with the assumption that acid aerosols and the fine particulate suflates disperse like gases. Roadside measurements of particulate lead emitted by motor vehicles were also used as a surrogate model to estimate incremental sulfate concentrations on busy expressways with increased catalyst use. Blood carboxyhemoglobin levels were used to estimate CO exposure. The resulting CO exposure estimates can be converted into incremental sulfate exposure estimates if all or most of the CO exposure is attributable to automobiles, and if the relationship between automotive emissions of sulfate and CO is known. Incremental increases in suspended sulfates and sulfuric acid aerosols are evaluated in terms of the number of vehicles equipped with oxidation catalysts. (Author abstract modified)

56666

APTIC NO. 81251

Franzke, C. and Brigitte Eckloff

CADMIUM CONTAMINATION OF FOODSTUFFS. *(Zur Kadmiumkontamination in Lebensmitteln). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 21(10):761-766, 1975. 46 refs.*

Studies on the environmental distribution and toxic effects of cadmium as an environmental contaminant are reviewed. Since cadmium is usually associated with zinc, lead, and arsenic in nature, factories processing such metals and their ores can be assumed to emit cadmium into the atmosphere. Cadmium is also present in paper, coal (1-2 ppm), lubricants, diesel and fuel oils (0.1-0.5 ppm), wood, and in certain organic wastes. Therefore, the combustion of such materials may be the source of cadmium emissions with flue gases. Gasoline contains negligible quantity of cadmium. Relationships were established between the cadmium level in air and soil and the distance of the sampling site from highways. Cadmium concentrations of 0.002-0.0015 microgram/cu m were measured in the USA and in West Germany. The smoke of one cigarette contains about 0.2 micrograms of cadmium. Inhalation of air containing 5-10 mg of Cd/cu m for several months caused poisoning symptoms in rabbits. Acute inhalative poisoning causes serious lung edema. A dose of 30-40 mg may be lethal for man. Chronic cadmium poisoning manifests itself primarily in liver and kidney damage. Causative relationships are suspected between cadmium uptake and chronic bronchitis, hypertension, and functional disturbances of the liver.

56667

APTIC NO. 75937

Geiger, James H. and Peter R. Charrington

EMISSIONS FROM GASOLINE OPERATIONS AT STANDARD OIL COMPANY OF CALIFORNIA RETAIL STATION, DAVIS, CALIFORNIA. *Betz Environmental Engineers, Inc., Office of Air and Waste Management Contract 68-02-1407, Proj. 00-4659-01, Task 3, Rept. 75-GAS-5-, 145p., May 1975.*

Hydrocarbon emissions tests were performed for vehicle refuelings and bulk gasoline deliveries at a Standard Oil Company retail station employing vapor recovery systems. The average emission factors for vehicle refuelings ranged from 0.170-0.228 cu ft/ cu ft, depending in nozzle configuration. The average volumetric recovery efficiency ranged from 75.9-80.7%. The emissions from the underground tanks used for bulk gasoline storage were zero during test periods for three of four conditions; thus, the total system emission factors and recovery efficiencies were the same as those calculated at the vehicle. During one test, 5.353 cu ft of vapor was emitted from the underground tank, yielding a system loss of 0.174 cu ft/cu ft and a system efficiency of 76.8%.

56668

APTIC NO. 81215

Ghezzi, U., C. Ortolani, and S. Pasini

NITRIC OXIDE FORMATION IN GAS TURBINES COMBUSTION CHAMBERS. *Riv. Combust., 29(7-8):329-326, July-Aug. 1975. 15 refs. (Presented at the Italian Flame Days, Sanremo, Italy, April 10-11, 1975.)*

The behavior of a gas turbine combustion chamber was experimentally examined from the point of view of nitric oxide emissions. Air/fuel ratios and temperatures inside the combustion chamber were measured and NO concentrations at the exhaust were calculated, assuming equilibrium concentrations of oxygen atoms. The calculated NO concentration was compared with the concentration experimentally measured at the combustion chamber exhaust. The comparison showed a remarkable discrepancy between analytical and experimental values. There are many possible reasons for the discrepancy. Many kinetic uncertainties depend on oxygen atom concentrations. However, the great disagreement observed with the lowest equivalence ratio (E.R.) values could not be ascribed to this parameter. A substantial change of the combustor behavior must be supposed with decreasing E. R. Also the kinetic mechanism change, with the assumption of reactions at lower activation energy, cannot explain the combustor behavior for the lowest E.R. values, particularly when the combustor intensity increases. The disagreement may be explained by phenomena having typical scales of much smaller size than those of the present measurements. (Author abstract modified)

56669 **APTIC NO. 81035**

Gibbs, G. W. and C. Y Hwang

PHYSICAL PARAMETERS OF AIRBORNE ASBESTOS FIBRES IN VARIOUS WORK ENVIRONMENTS--PRELIMINARY FINDINGS. *Am. Ind. Hyg. Assoc. J., 36(6):459-466, June 1975. 19 refs.*

The physical parameters of airborne asbestos fibers in various work environments are described. Samples of airborne dust were collected on nuclepore membrane filters and examined by scanning electron microscopy. The diameters and lengths of airborne fibers collected during the dumping of raw amosite at an asbestos products plant were greater than those of fibers collected during the application of amosite insulation. Chrysotile fibers collected in the carding area of an asbestos textile plant also tended to have smaller diameters than fibers collected in the dryer and bagging areas of an asbestos mill. The degree of protection afforded workers by optical counts using the membrane filter technique depends on the variety of asbestos and the stage of processing. (Author abstract modified)

56670 **APTIC NO. 81166**

Gostick, K. G. and W. Dermott

AGRICULTURAL ASPECTS OF NITRATES IN WATER. *Water Treat. Exam., 24(3):206-223, 1975. 32 refs.*

Sources of nitrogen for agricultural crops and losses of N2 from agriculture to surface and ground water is reviewed. Crops obtain N2 principally from mineralization of solid organic matter, natural fixation of atmospheric N2, animal manures, and inorganic fertilizers. The level of nitrate pollution of surface waters arising from agricultural sources can be affected by the type of farming, such as arable crops or grass, fertilizer or manure application, rates, time of application soil type, and quantity of drainage water produced. Leaching losses of N2 from hill pastures are usually very small. Leaching losses from arable land and intensively managed grass is restricted by husbandry practices, which are discussed. (Author abstract modified)

56671 **APTIC NO. 81630**

Guerrini, R. and A. Pennacchi

EVALUATION OF POLYNUCLEAR HYDROCARBONS IN STACK GASES FROM COMBUSTION OF FUEL OIL AND COAL.. *Riv. Combust., 29(7-8): 349-357, July-Aug. 1975. 24 refs. (Presented at the Italian Flame Days, Sanremo, Italy, April 10-11, 1975.)*

The concentration of polynuclear aromatic hydrocarbons, some of which are atmospheric pollutants, has been measured in the flue gases of power plants using both liquid and solid fuels. The function of electrostatic precipitators in trapping polynuclear aromatic hydrocarbons, which are adsorbed on the particulate matter, is also considered. The method used for the analysis is described. Combustion products, sampled isokinetically from flue gas, were collected and cooled in a scrubber operated with water at room temperature, followed by a high efficiency filter. At the end of the sampling system, the scrubbing water was filtered through a cellulose filter. The scrubber, the high efficiency filter, and the cellulose filter were treated with boiling cyclohexane for several hr. The extracts were then concentrated and chromatographed in two columns using activated aluminum oxide. Finally, a gas chromatogram of the purified extracts was carried out. (Author abstract)

56672 **APTIC NO. 81154**

Haessler, Guenther, Gerhard Rau, Torsten Schloevogt, and Karl Wiederhold

DESIGN PROBLEMS OF LARGE WET COOLING TOWERS. *(Auslegungsprobleme grosser Nasskuehltuerme). Text in German. Elektrizitaetswirtschaft, 74(24):895-897, 1975.*

Siting and design problems of large wet cooling towers for power plants are discussed. While the frequency of inversion situations should be taken into account, there are no long-term observations in this respect available. In general, wet cooling towers do not generate considerable emissions, and these emissions are often able to pierce inversion layers. Particulate matter, salt, and bacterial emissions, and water droplet emissions are a direct function of the separation efficiency of droplet generators. Efficiencies of up to 99.9% are now possible.

56673 **APTIC NO. 73109**

Hammerle, Robert H. and Mati Mikkor

SOME PHENOMENA WHICH CONTROL SULFURIC ACID EMISSION FROM AUTOMOTIVE CATALYSTS. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 12p., 1975. 9 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750097.)*

An experimental exhaust system using artificial automotive exhaust gas was used to investigate factors affecting the emission of sulfuric acid and sulfur dioxide from monolith noble metal oxidation catalysts. The storage rate of sulfur onto an initially sulfur-free catalyst decreased to a few percent of the sulfur rejection rate within 3-4 hr. The amount of sulfur on the catalyst when the catalyst was in equilibrium with 20 ppm sulfur in the gas phase varied between 0.3 wt% of the catalyst at 400 C to 0.1 wt% at 600 C. The sulfur readily desorbed from the catalyst when the gas phase sulfur content was lowered or when the catalyst temperature was increased. The conversion of sulfur dioxide to sulfuric acid reached thermodynamic equilibrium at temperatures of 400-500 C and space velocities of 30,000/hr; these conditions corresponded approximately to a small V8 engine at 20 mph cruise. Studies of simulated exhaust gas without a catalyst revealed that propylene, which is present in automobile exhaust, was the most efficient on a per-molecule basis in reducing sulfuric acid. Hydrogen also reduced sulfuric acid, wheras carbon monoxide and propane showed hardly any effect. The sulfuric acid reduction by propylene appeared to be a homogeneous reaction. (Author abstract modified)

56674 **APTIC NO. 74753**

Hara, Zenshiro, Masao Itabashi, Takeshi Shigematsu, Hiroshi Sugiyama, Hiroshi Moriyama, Kageyuki Yamaoka, Teruo Asami, Kiyoshi Takahisa, and Yasutada Okada

DUST POLLUTION IN KASHIMA AND KAMISU DISTRICTS. *(Kashima Kamisu chiiki no funjin osen). Text in Japanese. Preprint, Japan Society for General Research, Tokyo, Environmental Science Div., p. 130- 131, 1975. (Presented at the Japan Society for General Research Environmental Science Division Meeting, 1st, Tokyo, Japan, June 6-8, 1975.)*

Dust samples were collected from the surface of the soil in the neighborhood of a metal factory where the amount of fallout amounted to as much as 30 tons/sq km/mo. The metal concentrations were 0.18-0.35 ppm for cadmium, 35-130 for zinc, 10-20 for lead, 5-33 for copper, 12-27 for chromium, and 6-15 for nickel. Therefore, the contents of heavy metals were not extraordinarily high. Fallout on the roofs made of vinyl chloride was also analyzed. The contents of heavy metals were as follows (in descending order): iron, manganese, Zn, zirconium, strontium, Ni, Cd, Cr, yttrium, rubidium, krypton, Pb, and arsenic. The fallout also contained silicon dioxide, alpha ferric oxide, and manganese dioxide. Alpha ferric oxide, manganese dioxide and metallic cadmium possibly originated from sintering furnaces and converter furnaces in the factory. When the dusts on the vinyl roofs were extracted with carbon tetrachloride, about 0.13 wt% of an oily substance was obtained which appeared to be a phthalic acid diester. The presence of halides was also confirmed; these were not aromatic compounds.

56675

APTIC NO. 74757

Hara, Zenshiro and Masao Itabashi

THE HEAVY METAL POLLUTION BY THE SMOG DISCHARGED FROM A ZINC REFINERY. *(Aenseirenjo haien ni yoru jukinzoku osen). Text in Japanese. Preprint, Japan Society for General Research, Tokyo, Environmental Science Div., p. 128-129, 1975. 7 refs. (Presented at the Japan Society for General Research Environmental Science Division Meeting, 1st, Tokyo, Japan, June 6-8, 1975.)*

Pollution in the neighborhood of a zinc refinery was investigated. Houses 450-550 m from the factory were selected for sampling. Dusts present on the beam between the ceiling and the roof were collected. Analysis of the dusts revealed 200-980 ppm cadmium, 1.1-6.7% zinc, and 0.2-1.2% lead. The Cd content was almost proportional to the Zn content. The heavy metal content of the dust was about 10 times that in the soil around the houses. This indicates that the heavy metals reached the houses directly as dusts. Only 63 tons of metallic cadmium were produced in 1967 from 106.2 tons of cadmium present in refined ore. About 5 tons of cadmium were lost in the calcination process as dusts. About 14.6 tons of cadmium were lost in the manufacture of zinc oxide. About 6.9 tons of cadmium were lost in the process of cadmium production. Zinc is produced in the factory through the processes of calcination of refined ore, preparation of the solution for electrolytic production of zinc, electrolysis, zinc oxide production, and cadmium recovery from the residue.

56676

APTIC NO. 81146

Harker, A. B., P. J. Pagni, T. Novakov, and L. Hughes

MANGANESE EMISSIONS FROM COMBUSTORS. *Chemosphere, 4(6):339-344, Dec. 1975. 15 refs.*

X-ray photoelectron spectroscopy was used to analyze particulate exhaust collected from a model combustor burning fuel with methyl cyclopentadienyl manganese tricarbonyl (MMT) added in concentrations ranging from 0 to 0.25% by volume. The introduced manganese was emitted as manganese monoxide. The emitted manganese monoxide was intimately bound in the particulate and did not undergo further oxidation at ambient conditions. A minimum was observed in particulate mass emissions at low additive concentrations. (Author abstract modified)

56677

APTIC NO. 81143

Hickey, John L. S. and Parker C. Reist

HEALTH SIGNIFICANCE OF AIRBORNE MICROORGANISMS FROM WASTEWATER TREATMENT PROCESSES. PART II: HEALTH SIGNIFICANCE AND ALTERNATIVES FOR ACTION. *J. Water Pollution Control Federation, 47(12):2758-2773, Dec. 1975. 77 refs.*

The emission and spread of viable bacterial aerosols from aerated wastewater processes to areas where plant workers and nearby residents may be located has been adequately demonstrated. These aerosols contain a variety of virulent pathogenic bacterial genera and species in particles within the human respirable size range for both upper and lower respiratory tract deposition. Present evidence does not conclusively confirm or negate the existence of a health risk from viable wastewater aerosols. Potential effects include not only bacterial and viral respiratory and intestinal diseases but also allergenic response. The aeration of wastewater, wind speed, and aerosol dieoff are the primary factors shown to affect viable aerosol generation, survival, and dispersion from wastewater. (Author abstract modified)

56678

APTIC NO. 81173

Hickey, John L. S. and Parker C. Reist

HEALTH SIGNIFICANCE OF AIRBORNE MICROORGANISMS FROM WASTEWATER TREATMENT PROCESSES. PART I: SUMMARY OF INVESTIGATIONS. *J. Water Pollution Control Federation, 47(12):2741-2757, Dec. 1975. 54 refs.*

The measurement of the emission and airborne spread of viable microorganisms from wastewater collection, treatment, and disposal process has been the subject of several field studies. Premises common to most of the investigations are listed. Many types of bacteria are emitted to the air from wastewater during almost any stage of collection, treatment, or disposal and remain viable and airborne for considerable distances downwind, but interpretation of the results of these studies in terms of health hazards has been inconclusive. The results of field investigations and related literature are summarized. Terms related to aerosol characteristics are defined. Recovery of microorganisms in direct field investigations near sewers and a sludge plant led to the conclusion that a health hazard existed. Laboratory investigations indicate that some microorganisms are more likely than others to form viable aerosols. Particles containing proteins may be related to allergies as well as infections. Both settling particles and airborne particles were studied. There is disagreement as to whether viable aerosols pose a health hazard. Wastewater treatment workers are estimated to inhale fewer microorganisms than the required to cause infection in squirrel monkeys. The incidences of flu and colds were higher among wastewater workers than among drinking water treatment workers by factors of 50 and 28%, respectively, but the findings are considered tentative because of the number of doubtful cases.

56679

APTIC NO. 71854

Hofmann, D. J., D. E. Carroll, and J. M. Rosen

ESTIMATE OF THE CONTRIBUTION OF THE SPACE SHUTTLE EFFLUENT TO THE NATURAL STRATOSPHERIC AEROSOL. *Preprint, Wyoming Univ., Laramie, Dept. of Physics and Astronomy, 14p., 1975 (?). 7 refs.*

The stratospheric equilibrium distribution of aluminum oxide particles emitted from solid fuel rocket boosters as exhaust products is mathematically estimated to assess the possible contribution of space shuttle effluent from 580 planned space shuttle flights for the period 1979-1990 to the natural stratospheric aerosol. Space shuttle effluent does not appear to directly alter the current stratospheric sulfate layer, though it may noticeably increase the number of very small particles above about 25 km altitude. The impact of this postulated increase cannot be assessed until more is known about natural condensation nuclei, sulfur dioxide, and other constituents of the gas-phase particle formation process in the stratosphere to a height of 45 km. Aluminum oxide particles are capable of serving as sites for condensation; and, if condensation is important in producing large particles in the stratosphere, then the presence of condensation nuclei may result in a number of upper stratospheric changes. A program for monitoring particles with a radius of 0.01 micron above 20 km altitude is needed to establish natural conditions. (Author conclusions modified)

56680

APTIC NO. 78697

Hogstrom, Ulf

AIR POLLUTION IN SWEDISH COMMUNITIES. *Ambio, 4(3):120-125, 1975. 10 refs.*

Basic data on sulfur dioxide, smoke, dust deposition, wind speed and direction, and temperature gradient were obtained and analyzed in studies carried out in a number of Swedish communities of varying size and type. To determine the relative importance of different sources to the observed pollution, the pollution data at each measurement station were correlated with wind direction data to produce pollution wind roses. Having a number of stations conveniently sited in the community makes it possible to produce a map that gives the relative source distribution. The influence of point sources on the local air pollution situation was quite marginal in all the communities studied. The many low-level emissions were the dominating air pollution sources in all these communities. Space heating provides the most important pollution source. The mean pollution level is strongly dependent on temperature. A big difference is often found in summertime and wintertime concentrations in Swedish communities, and at the higher winter value is more relevant from the health point of view than the smoothed yearly mean. Ways of improving the situation include general sulfur reduction in fuels and effective use of district heating for whole communities.

56681 **APTIC NO. 77374**

Hosokawa, Y., S. Izumi, T. Nara, K. Negishi, and H. Hiraide

ON THE INVESTIGATION OF VANADIUM AT MUTSU CITY. *(Mutsu-shi ni okeru banadiumu chosa). Text in Japanese. Aomori-ken Kogai Senta Shoho (Rep. Environ. Pollut. Control Cent. Aomori Prefect.), no. 1:55-59, Feb. 1975.*

The environmental pollution by vanadium emitted from the Tohoku Satetsu Ohminato Mill where vanadium pentoxide (7 tons/mo) is produced from iron sand slag (55 tons/mo) was investigated. Suspended particulate samples were collected using a high volume air sampler and a cyclone type low volume air sampler at two points on the property line of the mill and three points in a nearby residential area during the period of Jan. 29 to Feb. 13, 1973, and metal concentrations were determined by atomic absorption analysis. The V concentration (micrograms/cu m) was 0.03-5.54 on the property line and 0-0.23 in the residential area. Concentrations of other metals tended to be proportional to the concentration of iron. The V concentration measured simultaneously in Hachinohe City was 0.01-0.24 micrograms/cu m. The much higher V concentration in Mutsu City was attributed to the emission from the mill. The V concentrations in furnace exhaust gas were 3 mg/N cu m for a calcination furnace and 0.36 mg/N cu m for an electric furnace. The particulate sample collected inside of the furnace room contained 369.5 micrograms/ cu m of V, which was equivalent to the V content in raw material slag.

56682 **APTIC NO. 81347**

Huber, Hans

THE VINYLCHLORIDE PROBLEM. *(Das Vinylchlorid-Problem). Text in German. Chem.-Ing.-Tech., 47(19):803-807, 1975. 2 refs.*

Problems of vinyl chloride emissions during storage and processing, and of vinyl chloride residues in PVC (polyvinylchloride) products are discussed in the light of the recent discovery of the toxic and carcinogenic effects of this compound. Acroosteolysis of the finger bones, and lesions of the liver and kidney were observed among workers exposed to vinyl chloride in the air in PVC production. A total of 28 cases of hepatic angiosarcoma were registered among 35,000 PVC workers as of May 1975. Vinyl chloride is released before plasticization but not from the granulated products. Vinyl chloride concentrations of up to 100 ppm were measured in storage areas, which makes exhaust necessary. Otherwise, the concentrations are usually below 5 ppm in storage spaces. During processing, the vinyl chloride emission is highest during the hot mixing operation. The maximum allowable workplace concentration of vinyl chloride in West Germany is set at 5 ppm as a yearly average, and the maximum allowable hourly concentration is 15 ppm. The MAC value is set at 1 ppm in the U. S. and Sweden.

56683 **APTIC NO. 73892**

Ito, Ryusuke and Tadao Obata

SMALL DIESEL ENGINE. *(Hanyo Kogata dizeru kikan). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 14(2):28-32, Feb. 1975.*

A general discussion is given on the trend of small diesel engine technology and pollution prevention and safety measures. The typical small diesel engine by the major manufacturers has the following characteristics: output range, 4-18 PS; engine rotation speed 2200-2400 rpm; piston speed, 5-8 m/s; effective pressure, 6.5-7.5 kg/sq cm; weight per unit horse power, 10-12 kg; and fuel consumption, 190-220 g/PS-h. The present emission standards for automobile diesel engines by the 6-mode method were issued on May 24, 1974. The nitric oxide standard is 1000 ppm for the direct injection type and 590 ppm for the pre-combustion type. The hydrocarbon and carbon monoxide standards are 670 ppm and 980 ppm, respectively. The nitrogen oxide + HC emission level for pre-combustion small diesel engine, which has a stroke volume below 1.0 l, was below 5 g/PS-h. Active researches have been conducted to reduce the NOx + HC level to below 3 g/PS-h.

56684 **APTIC NO. 81072**

Jakkiwar, M. S. and R. H. Typkary

POLLUTION CONTROL IN FERRO ALLOYS INDUSTRY. *J. Inst. Engrs. (India) (Calcutta), vol. 56:30-33, July 1975. 10 refs. (Presented at the Environmental Pollution due to Mining, Metallurgical, and Chemical Industries Seminar, Dhanbad, India, Dec. 21-22, 1974.)*

The sources and control of pollution in the ferroalloy industry in India are discussed. Basic ferroalloys are produced by carbon reduction in closed electric arc furnaces, and the sources of pollution from these furnaces are gases, dust, and fumes. The average analysis of the dust in 84.9% silica, 7.02% silicon carbide, and 1.66% carbon. With silicon alloy production the fume is grey and has a high percentage of SiO2 resulting from the oxidation of SiO. Chromium furnaces produce a light fume having iron oxide, chromium oxide, silica SiO2, and magnesium oxide. The brown fumes emitted during ferro- manganese production are a mixture of SiO2 and manganese oxides. Cleaning of waste gases by dry and wet methods is illustrated. The pollution control measures are essential in electro-thermal as well as metallothermic processes to recirculate the dust and to achieve higher recoveries of costly raw materials. (Author abstract modified)

56685 **APTIC NO. 81492**

Jungers, Robert H., Robert E. Lee, Jr., and Darryl J. von Lehmden

THE EPA NATIONAL FUELS SURVEILLANCE NETWORK. I. TRACE CONSTITUENTS IN GASOLINE AND COMMERCIAL GASOLINE FUEL ADDITIVES. *Environ. Health Perspect., vol. 10:143-150, April 1975. 23 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

A National Fuels Surveillance Network has been established to collect gasoline and other fuels through the 10 regional offices of the Environmental Protection Agency. Physical, chemical, and trace element analytical determinations are made on the collected fuel samples to detect components which may present an air pollution hazard or poison exhaust catalytic control devices. The network operation and chemical analytical methods used are described. A summary of trace elemental constituents in over 50 gasoline samples and 18 commercially marketed consumer purchased gasoline additives is presented. Quantities of manganese, nickel, chromium, zinc, copper, iron, antimony, boron, magnesium, lead, and sulfur were found in most regular and premium gasolines. Environmental implications of trace constituents in gasoline are discussed. (Author abstract modified)

56686 **APTIC NO. 81343**

Kautz, K., H. Kirsch, and D. W. Laufhuette

TRACE ELEMENT CONCENTRATIONS IN HARD COAL AND CLEANED GAS DUSTS DEVELOPING FROM IT. *(Ueber Spurenelementgehalte in Steinkohlen und den daraus entstehenden Reingasstaeuben). Text in German. VGB Kraftwerkstechnik, 55(10):672-676, 1975.*

Twenty-seven hard coal samples of different origin, and 20 dust samples collected after electrostatic precipitators in power plants firing these coal were analyzed for their trace element contents. A comparison of the trace element concentrations in coal ashes, coal, and dust revealed that correlations between the concentrations in the coal or ashes and in the dust do not exist necessarily. The mercury and iodine concentrations in the dust samples were usually lower than in the coal as a result of volatilization during the combustion process. The boron, barium, bismuth, cadmium, cobalt, copper, molybdenum, nickel, titanium, vanadium and tungsten concentrations were about the same in the coal, ashes, and dust samples, while the arsenic, beryllium, chromium, fluorine, phosphorus, and tellurium concentrations were higher in dust than in ashes or coal by 2 to 3 times. The silver, lead, tin, selenium, strontium, uranium, and zinc concentrations were usually up to 10 times higher in dust than in ashes.

56687 **APTIC NO. 81312**

Kellogg, William W.

QUEST FOR LONG-TERM SOLUTIONS FOR OLD PROBLEMS. *Environ. Health Perspect., vol. 10:197-201, April 1975. (Presented at the Conference on Bio-Meteorological Consequences of Environmental Controls, Research Triangle Park, N. C., May 14-15, 1974.)*

Examples of repercussions resulting from air pollution control measures are cited. The replacement of lead in automobile gasoline with aromatic hydrocarbons can result in increased concentrations of carcinogenic compounds in the exhaust. The use of low sulfur fuel, although reducing sulfur dioxide emissions, also reduces electrostatic precipitator performance and thus tends to raise particulate emission levels. Dispersion of pollutants by the use of very tall chimneys to carry stack gases out of the immediate surface environment leads to dangerously high concentrations of pollutants at sites downwind of the source. The increasing particulate load in the air over regions outside urban areas is the result of additional particulate emissions from new rural power plants in combination with smaller uncontrolled aerosols originating from urban areas and remaining airborne for many days. Emphasis is placed on the importance of tradeoffs in environmental control policies and the danger of overemphasis of past errors.

56688 **APTIC NO. 81106**

Kliemann, S.

DRY COOLING TOWERS. *(Trockenkuehltuerme). Text in German. VDI (Ver. Deut. Ingr.) Ber., vol. 236:241-249, 1975.*

The principle, design, and environmental aspects of dry cooling towers are described. In the 1980s, it will be increasingly necessary to select power plant sites in areas where dry cooling towers will be a must. Air condensation installations of the direct system are feasible for medium block performances, and those of the indirect system are available for unit capacities of 1000 MW and over. Compared with wet cooling towers, dry cooling towers have a significantly reduced environmental impact in terms of water discharge and fog formation, and the meteorological impacts are expected to be negligible. However, dry cooling towers may cause cloud formation at a certain altitude above the outlet. The emissions may pierce inversion layers.

56689 **APTIC NO. 81674**

Kobayashi, Ikuo, Masao Suzuki, and Hiroshi Taniguchi

ON THE INDOOR ENVIRONMENT IN THE CASE OF USING LOW NOX BURNER FOR HEATING. *(Danboyo tei NOx bana nenshodoki no shitsunai kankyo ni tsuite). Text in Japanese. Preprint, Japan Society of Heating, Air-Conditioning and Sanitary Engineers, Tokyo, p. 149-152, 1975. 5 refs. (Presented at the Japan Society of Heating, Air-Conditioning and Sanitary Engineers Annual Meeting, Tokyo, Japan, Oct. 13-14, 1975.)*

A low-nitrogen oxides gas burner designed for room heating, consisting of a ceramic cylinder and a refractory metal net cylinder surrounded by refractory crystalized glass is discussed. A complete premixing combustion method is used, and the emission quantity of nitrogen oxides is extremely low due to the low maximum flame temperature and low average temperature in the combustion chamber, with uniform temperature distribution. Using city gas as a fuel, the NOx emission quantity was about 0.0025 mg/kcal, which is extremely low compared to that of other heating systems. The effects of the combustion gas from such a burner on the room environment were investigated by measuring concentrations of NOx, carbon monoxide, carbon dioxide, and oxygen, and the temperature distribution in the room. The equilibrium concentrations were 0.025 ppm for NOx, 0.5% for CO2, 2 ppm for CO and 20% for O2, which complied with the indoor environmental standards. The room temperature was 20 C at 1.5 m above the floor and 11 C at the floor level, indicating the high efficiency of heating.

56690 **APTIC NO. 77726**

Kosky, Kennard F. and Martin P. Wanielista

FUGITIVE PARTICULATE FROM HIGHWAY CONSTRUCTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 13p., 1975. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-36.3.)*

The air quality impact of highway construction activities was assessed by collecting 132 24-hour high-volume samples at nine sampling locations at various distances and elevations with respect to the construction site. Violations of the primary and secondary air quality standards for particulate matter (24-hour) were observed 17.4 and 35.6% of the valid sampling time, respectively. Particle size distributions ranged from 3.7-7.5 micron. The occurrence of precipitation reduced mean particulate concentrations by about 53%. The particulate concentration also decreased rapidly with increasing distance from the road. The largest number of high total suspended particulate concentrations was observed when the wind direction was at a 45- degree angle from the direction of the roadway. (Author abstract modified)

56691 **APTIC NO. 81321**

Lee, Douglas H. K.

BIOMETEOROLOGICAL CONSEQUENCES OF ENVIRONMENTAL CONTROLS: OVERVIEW. *Environ. Health Perspect., vol. 10:183-196, April 1975. (Presented at the Conference on Biometeorological Consequences of Environmental Controls, Research Triangle Park, N. C., May 14-15, 1974.)*

An overview of unexpected secondary effects resulting from environmental controls is presented. Topics covered include: the meteorological and biological impacts of current and proposed emission controls, housing patterns, and land use. Examples of unbalanced controls leading to the generation of secondary pollutants include: the substitution of aromatics for lead in gasoline which results in the formation of higher local concentrations of oxidants and polynuclear compounds, the increased emission of nitrogen oxides resulting from the control of automobile emissions of hydrocarbons and carbon monoxide, the production of sulfates by automotive catalytic converters, and the transport of pollutants to downwind areas as a result of the use of tall stacks.

56692 **APTIC NO. 81300**

Lee, T. G., W. J. Parker, and M. Tyron

LABORATORY FIRE PERFORMANCE CHARACTERISTICS OF A DIBROMOTETRAFLUOROETHANE-BLOWN RIGID POLYURETHANE FOAM. *J. Fire Flammability, vol. 6:499-510, Oct. 1975. 8 refs.*

The fire performance characteristics of a dibromotetrafluoroethane blown rigid polyurethane foam with a core density of 0.046 g/cu cm were measured by several laboratory test methods. Measurements included: surface flammability, smoke and gases generated at elevated temperature and during combustion, ignition temperature, rate of heat release, and fire growth. The maximum concentration of the blowing agent in the specimen was 13 wt%. The release of the blowing agent from the heated specimen began at 60 C and reached a rate of 3 wt%/hr at 100 C. The material had a flame spread index of 11 and smoke levels of 170 and 480, respectively. The measured rate of heat release was 9.8 W/sq cm, about five times that of a fibrous glass insulation. The measured flash ignition temperature was 530 C for thee material. (Author abstract modified)

56693 **APTIC NO. 81077**

Lefcoe, Neville M. and Ion I. Inculet

PARTICULATES IN DOMESTIC PREMISES. II. AMBIENT LEVELS AND INDOOR-OUTDOOR RELATIONSHIPS. *Arch. Environ. Health, 30(12): 565-570, Dec. 1975. 11 refs.*

Three indoor environments (two residential, one institutional), were monitored for particulate and gaseous air pollutants over a 1-year period. Inside air particulate levels decreased at night and under conditions of no household activity. Different homes show different time lags in correlating inside versus outside particle counts. Indoor particle count reduction correlated to rate of air flow through the precipitator. The standard, portable household vacuum cleaner produces about a 100% increase in counts of particles measuring 1 micron and larger, as compared to a 50% increase produced by the central vacuum system. Particulates that are smaller than 1 micron are not substantially affected by household activity, but they are affected by smoking. The indoor gaseous pollutants have very low maximum levels. (Author abstract modified)

56694 **APTIC NO. 81037**

Legille, E., F. A. Berczynski, and K. G. Heiss

A SLAGGING PYROLYSIS SOLID WASTE CONVERSION SYSTEM. *S. A. Paul Wurth, Luxembourg (Belgium) and Andco Inc., Buffalo, N. Y., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 232-237. (Nov. 3-5.)*

The composition and fate of the hot gases in the Andco Torrax refuse conversion system are described. The process is characterized as high temperature slagging pyrolysis. Pyrolysis of the organic materials causes the volatile fraction to distill, forming combustible liquids and vapors. The vapors are composed primarily of methane, hydrogen, carbon monoxide, carbon dioxide, water, and the more complex hydrocarbons such as ethane, propane, oils, and tars. The material remaining after pyrolysis is char. The gases are characterized by high temperature, constant temperature due to the thermal inertial of the secondary combustion chamber, homogeneity, and an absence of unburned material, low volumetric flow and low particulate loading. The boiler is designed for maximum gas throughput of 36,800 N cu m/hr, a maximum gas temperature of 1370 C, and a nominal gas temperature of 1250 C.

56695 **APTIC NO. 76751**

Leonard, D. A.

RAMAN AND FLUORESCENCE LIDAR MEASUREMENTS OF AIRCRAFT ENGINE EMISSIONS. *Opt. Quantum Electron., 7(3):197-209, May 1975. 10 refs. (Presented at the International Laser Radar Conference, 1974.)*

Laser-induced Raman and fluorescent measurements of aircraft gas turbine exhaust emissions were made. The exhaust was also analyzed by conventional instruments for carbons monoxide, carbon dioxide, nitric oxide, nitrogen oxides, total hydrocarbons, smoke, and temperature; these data were used as a calibration standard for the evaluation of the laser Raman instrument. Good correlations were obtained for CO2, oxygen, smoke, hydrocarbons, and temperature. The laser instrument was not sensitive enough for NO detection, but the data analysis indicated that 100 ppm may be detectable with instrument improvements. Carbon monoxide analysis was not attempted, though it appeared that further research will result in its detection. The detection of nitrogen dioxide or NOx also was not attempted because theoretical and laboratory analyses indicated severe interference with CO2. (Author abstract modified)

56696 **APTIC NO. 81434**

Mallek, H.

INCINERATOR FOR MEDICAL WASTE. *(Verbrennungsanlage fuer Medizinabfaelle). Text in German. Wasser Luft Betrieb, 19(11):653-654, Nov. 1975.*

A 50 kg/hr-capacity incinerator, developed by Kernforschungsanlage Juelich for the destruction and sterilization of medical wastes, is described. The wastes are charged on to the top of an oscillating grate from which they are dumped into the principal incineration chamber for combustion at 800 C without auxiliary firing. The ashes are periodically dumped to the ash bed that is kept at temperatures over 1000 C for 2 days for complete sterilization before they are discharged. The flue gases are led through a filter mat on which an ash layer with 1000 C temperature builds up for the efficient afterburning of the flue gas components. Suspended particles are retained by the mat filter. The particle emission is below 50 mg/cu m, and the carbon monoxide content is about 0.01%. The incinerator is envisaged for scale-up to 1000 kg/hr capacity.

56697 **APTIC NO. 81341**

Masek, Vaclav

GASIFICATION AND HEAT PROPERTIES OF FLY DUSTS FROM COKE OVENS. *(TG- und DTA-Eigenschaften von Kokerei-Flugstaeuben). Text in German. Staub, Reinhaltung Luft, 35(10):359-362, Oct. 1975. 3 refs.*

The volatilization of 6 respirable and 12 non-respirable fractions of coke oven dust was studied in air or argon atmosphere in the temperature range of 25-1400 C at temperature increments of 5, 10, or 50 C/min, and the reactions occurring in these fractions were investigated by differential thermal analysis (DTA). The weight loss due to volatility, as measured at a temperature increment of 50 C/min in air was greater than in an argon atmosphere at a 5 C/min temperature increment. The losses were greater in respirable than in non-respirable fractions, and greater for fly dust from bituminous coal cokeries than for pitch coke plants. The proportion of exothermal reactions was greater in respirable fractions in air than in non-respirable fractions or in argon atmosphere. From about 700 C upward the reactions were predominantly endothermal.

56698 **APTIC NO. 81067**

Meier, Willy E.

ADVANTAGES OF DRYING AND RECYCLING OF SEWAGE SLUDGE. *OFAG ZUERICH, Zurich (Switzerland), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 384-388. (Nov. 3-5.)*

A new concept for drying sludge from industrial processes and from water purification plants was developed. The exhaust gases from a municipal incinerator were used for the sludge drying process. Other advantages include: compact design, no odor problems, uniform and powdery dry product, and low construction and assembly costs. The exhaust gases from the sludge drying process are recirculated to the secondary chamber of the waste furnace to avoid odors and to raise the efficiency of the waste combustion process.

56699 **APTIC NO. 81404**

Merenda, Joseph

UNREGULATED EMISSIONS FROM CATALYST-EQUIPPED CARS: EPA OVERVIEW. *Environ. Health Perspect., vol. 10:169-171, April 1975. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

Work to date has substantiated the prudence of the Environmental Protection Agency s decision to accompany initial catalyst use with an accelerated research program on the possible adverse effects of unregulated catalyst emissions. The EPA now has a tentative standard method for automotive sulfate determination. The rough estimate of 0.05 g sulfuric acid/mi, assuming 0.03% sulfur fuel, appears reasonable although perhaps a bit high, since it appears that control systems designed for the 1975 interim standards may have somewhat lower sulfate emissions than the statutory standards. There are clearly conflicting data on fuel sulfur levels. The required technology for gasoline desulfurization is available. Estimates of automotive platinum emissions have varied by a factor of 1000. The form in which such emissions occur is completely unknown.

56700 APTIC NO. 78251

Mizutani, Y.

PROCESSES OF COMBUSTION AND POLLUTANT FORMATION IN A PRACTICAL SYSTEM. *(Nenshokiki ni okeru nensho to yugai busshitsu no seisei). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 29(8):767-775, Aug. 1975.*

Analytical methods for a continuous combustion system are reviewed. The mechanistic theory, the time-average mechanistic theory, and the eddy break-up model are discussed. The population balance theory or chemical reactor theory is reviewed with descriptions of known models such as the plug-flow reactor, the well-stirred reactor, the 2-region model with a single parameter, the multiple-flow model, the modular model, and the cohesion-dispersion model. The theoretical analysis of the formation of toxic substances is reviewed with a description of a C-H-O-N equilibrium model, a CHO equilibrium model, a one- step reaction model, a semi-overall hydrocarbon reaction model, and a chain reaction model. The reciprocating internal combustion engine is classified into a spark ignition engine and a diesel engine, and the difference in theoretical treatment is discussed. The application of the analytical method developed for a continuous combustion system to the reciprocating internal combustion engine is also discussed.

56701 APTIC NO. 81457

Morr, A. R., J. B. Heywood, and A. H. Fitch

MEASUREMENTS AND PREDICTIONS OF CARBON MONOXIDE EMISSIONS FROM AN INDUSTRIAL GAS TURBINE. *Combust. Sci. Technol., 11(3 and 4):97-109, 1975. 20 refs.*

Measurements and predictions of carbon monoxide emissions from industrial gas turbine engines are presented. Mechanisms responsible for excessive carbon monoxide concentrations are studied for the entire turbine power range using a rate limited partial equilibrium approach, and a simple model is formulated which yields reasonable agreement with measured values and predicts CO emission variation with load. Excessive CO emissions appear to be caused by the rapid quenching of primary zone combustion gas by the dilution air jets. A fraction of the gas contains CO concentrations far above equilibrium at the jet interfaces. A contributing factor to excessive CO emissions is poor fuel distribution in the primary zone. Where fuel burns with air at an equivalence ratio of less than 0.6, some of the CO formed by rapid partial oxidation of the fuel remains throughout the engine. Minimum CO emission rates from industrial gas turbine engines appear to be attainable by burning a uniform mixture of fuel and air in the primary zone at an equivalence ratio of 0.7.

56702 APTIC NO. 81238

Nagami, K.

AIR POLLUTION COUNTERMEASURES AND ENERGY SUPPLY-DEMAND PLANS. *(Taiki osen taisaku to enerugi jukyu keikaku). Text in Japanese. Taiki Osen Nyusu (Air Pollution News), no. 90:2-6, Sept. 1975. 13 refs.*

Long-term energy supply-demand plans for Japan, announced in July 1975 by a consulting committee to MITI are summarized, and implications are discussed. The annual growth rate of the Japanese GNP from 1975-1985 is assumed to be 6.6%. Primary energy, in terms of conversion to oil, is 410 million kl for 1973; 560 million kl for 1980; 760 million kl for 1985. Of this energy, imported energy (liquefied natural gas, coal, oil) amounts to 89.9% of the total in 1973; 87.5% in 1980; 82.4% in 1985. Nuclear energy (quasi-domestic energy) is 0.6% of the total in 1973; 4.4% in 1980; and 9.6% in 1985. Imported oil comprises 77.4% (318 million kl) of the total primary energy in 1973; 68.9% (393 million kl) in 1980; and 63.3% (485 million kl) in 1985. The projected importation of 1.5 times as much oil in 1985 as in 1973 implies the necessity for energy conservation measures, as well as development of new energy sources, and acceleration of nuclear energy development. Additionally, if 485 million kl of oil (assumed sulfur content 1.6%) is used in 1985, about 7.5 million tons of sulfur per year would be released. If unrecovered, this amount of sulfur, 2.5 times the total for 1973, would increase atmospheric sulfur dioxide concentrations as well as the spread of air pollution. However, recovery of sulfur does not guarantee its commercial use, and the problem of industrial waste disposal is acute.

56703 APTIC NO. 81732

Nakamura, Kenya and Hiroshi Okano

LABYRINTH STRUCTURE FOR AIR OUTLET OF GAS TURBINE ENGINE BEARING CHAMBER. *(Toyota Jidosha Kogyo Kabushiki, Kaisha (Japan)) U. S. Pat. 3,907,457. 6p., Sept. 23, 1975. 7 refs. (Appl. Aug. 20, 1973, 2 claims).*

An improved labyrinth structure for the air outlet of a gas turbine engine bearing chamber is described which possesses increased cooling efficiency. The bearing chamber of the gas turbine engine is provided with an air outlet consisting of a labyrinthine flow path and is formed around the turbine main shaft at a high temperature portion in the vicinity of the gas turbine. Intake air is fed to the chamber by the turbine compressor, and a labyrinthine outlet flow path is formed by a pair of annular sections which comprise two sets of concentric annular projections. Each of the sets of annular projections is spaced in a manner to define annular spaces therebetween, and the projections are arranged in a staggered opposed relationship with each of one of the projections extending into the annular spaces formed between pairs of the other set of projections. Attached to one set of projections are several thin-walled annual plates which are located to extend diametrically from each projection and transversely across the spaces formed between the complementary sets of projections. The plates terminate short of engagement with the complementary sets of projections to define therebetween spaces which operate as flow orifices for regulating the flow rate of the air exhausting from the bearing chamber. (Author abstract modified)

56704 APTIC NO. 81588

Neligan, Robert E.

EMISSION MODIFICATIONS: OVERVIEW. *Environ. Health Perspect., vol. 10:203-205, April 1975. (Presented at the Conference on Bio-Meteorological Consequences of Environmental Controls, Research Triangle Park, N. C., May 14-15, 1974.)*

Examples of the occurrence of unexpected and unwelcomed secondary effects resulting from the imposition of environmental control measures are presented. Although the replacement of more highly reactive hydrocarbons with less reactive hydrocarbons reduces the oxidant problem in local areas, this control measure results in higher oxidant formations at downwind receptor sites. The substitution of aromatic hydrocarbons for lead to enhance the octane rating of gasoline results in both higher local oxidant formation and increased concentrations of polynuclear compounds having carcinogenic properties. Catalytic afterburners for the control of automobile exhaust emissions are capable of generating new pollutants (sulfates) as a result of the oxidation of sulfur in gasoline. The use of afterburners when not properly maintained can result in the formation of more highly reactive hydrocarbons than those being controlled. Tall stacks, although providing relief to small local areas, are capable of causing detrimental effects many miles away downwind from the source.

56705 **APTIC NO. 81638**

Pai, B. R., W. Richter, and T. M. Lowes

FLOW AND MIXING IN CONFINED AXIAL FLOWS. *J. Inst. Fuel, vol. 167:185-196, Dec. 1975. 18 refs.*

The aerodynamic and mixing fields occurring in models representative of cement kiln and shell boiler type furnaces were studied in order to develop and test mathematical models for predicting furnace performance. The experimental investigation included the study of single and double concentric jets in a cylindrical confining chamber. The influence of density gradient between the primary and secondary flow was studied, but only flows without swirl were considered. The prediction procedure was based on a numerical technique for the calculation of steady turbulent flows in axisymmetric configurations. This method required the specification of laws for turbulent exchange of momentum and scalar quantities; the implications of two such laws, namely the algebraic ad hoc viscosity law and the k-W model of turbulence, were examined with reference to the experimental data. The problem of specifying boundary conditions at the inlet is discussed. The prediction procedure provided realistic predictions of flow and mixing patterns over a range for furnace geometries of the cement kiln or shell boiler type, provided they could be represented by axisymmetrical models. Computations with the ad hoc viscosity law overpredicted the axial decay of velocity and concentration. The general level of agreement between predictions of time averaged properties from the k-W model was good. The limited turbulence measurements allowed only a qualitative assessment of the prediction of the kinetic energy of turbulence. Finally, predictions were made for an isothermal scale model of the IJmuiden furnace of square cross section. The good agreement suggested that the application of an axisymmetric procedure to a rectangular furnace is not a bad approximation, at least in the forward flow region. (Author abstract modified)

56706 **APTIC NO. 81273**

Perry, R. and R. M. Harrison

GENERAL TRENDS IN AIR POLLUTION AND SOME ASPECTS OF ITS RELATION TO WATER POLLUTION CONTROL. *Public Health Engr., no. 18:158-168, Nov. 1975. 21 refs.*

General trends in air pollution in the United Kingdom as defined by the National Survey are described. Emissions from combustion processes are described in relation to currently available control technology, with particular emphasis on emissions from motor vehicles and from continuous-feed refuse incinerators. The trend in average urban concentrations of smoke and sulfur dioxide is clearly downward, smoke having decreased by 70% since 1958 and SO2 by 40%. Emissions from uncontrolled motor vehicles include hydrocarbons, carbon monoxide, oxides of nitrogen, and both inorganic and organic lead compounds. These are emitted into the atmosphere by evaporation from fuel tanks and carburetors as blowby gases from the crankcase and as exhaust gases. Air pollution from incinerators has generally received the greatest attention of all the types of incinerator waste discharge. The nature of the emissions is very much dependent upon the composition of the refuse, the design of the incinerator, and the type of air pollution control devices employed. Inorganic particulate emissions are strongly correlated with the refuse ash composition. A smaller proportion of the inorganic material is created by oxidation and volatilization of metals, followed by entrainment in the flue gases. Advances in air pollution monitoring are discussed and applied to sulfur dioxide.

56707 **APTIC NO. 78162**

Ruppert, Hans

GEOCHEMICAL INVESTIGATIONS ON ATMOSPHERIC PRECIPITATION IN A MEDIUM SIZED CITY (GOETTINGEN, F.R.G.). *Water, Air, Soil Pollut., 4(3/4):447-460, July/Aug. 1975. 28 refs.*

Levels and sources of atmospheric trace elements were analyzed in a medium size non-industrial city. Ten samples of precipitation were collected from May 10 to June 4, 1972, and from Sept. 1 to Oct. 1, 1972 in Goettingen, F.R.G. Anthropogenic sources are responsible for the trace element accumulation: combustion of liquid petroleum fuels contributes to lead, vanadium, nickel, molybdenum, mercury, and sulfate; combustion of coal to barium, sulfate, and chloride, and to the readily volatile elements such as Hg, cadmium, tellurium, bismuth, and silver; combustion of refuse to Ag, Bi, Pb, Cd, Hg, zinc, chromium, copper, Ba, and Mo in highly variable amounts. Fertilizers and road salts change the chemistry of soils and indirectly supply potassium, alkali, and alkaline-earth metals to the fly dust. Modest industrial activity is responsible for high Cu and Cr concentrations. Despite the appreciable accumulation of some toxic elements, the precipitation in Goettingen is relatively pure compared to other areas. Favorable geologic conditions around Goettingen decrease the negative influences of potentially harmful airborne elements. The high carbonate content in the dust neutralizes the anthropogenic acids in the rainwater. The toxic trace elements are diluted, especially in the center of Goettingen, by a large amount of airborne dust. (Author abstract modified)

56708 **APTIC NO. 81178**

Sakai, Yukio and Hiroshi Tsuji

STUDY OF MATRIX GAS BURNER OF DIFFUSED FLAME TYPE. *(Kakusan kaengata matorikkusu gasu bana no kenkyu). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, p. 83-85, 1975. (Presented at the Japan Society of Mechanical Engineers Kansai Branch Lecture Meeting, 233rd, Osaka, Japan, June 10, 1975.)*

Experiments with a matrix burner of the diffused flame type were conducted to study combustion characteristics, flame structure, and emission gas composition. Experiments with the structure of the stabilized flame when the air speed is lowered, done by observing the shape of the stabilized flame were conducted. The structure of the flame and the emission gas composition were studied. When the air speed was varied, the flame shape changed remarkably. When the air speed was high, the cross section of the upper part of the flame was dented, with much improvement in emission gas composition. When air speed was lower than 1 m/s, nearly perfect combustion took place. Therefore, in order to put this type of burner into practical use, it is necessary to suppress the air speed.

56709 **APTIC NO. 81728**

Sakano, Akira and Hiroshi Kameyama

SMOKE AND SOOT DETERMINATION AFTER THE STACK DESULFURIZATION. *(Haien datsuryo go no endo ni okeru baijin sokutei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):331, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 74.)*

The results of analysis of soot and dust from smoke stacks before and after exhaust gas desulfurization are reported. The analytic method used was the JID Z-8808 1 type cylindrical filter paper method. The soot and dust contained in the smoke stack of heavy oil fired boilers were analyzed. The sulfur oxides concentration after desulfurization was very large, and the apparent volume of dust and soot increased accordingly. The basic conditions for establishment of an accurate dust/soot analytic method using a comparatively simplified operation such as heating were studied, including investigation of the dehydration efficiency of heated filter paper, the desulfurization of the filter paper by heating, the causes of the sulfuric acid produced, and measuring values when the aspirating section of the device is heated.

56710 **APTIC NO. 81179**

Sawa, T., K. Morimoto, T. Konishi, and Y. Sakoda

SURVEY OF OBNOXIOUS SMELL AROUND UJI CITY. *(Uji shiiki no akushu chosa ni tsuite). Text in Japanese. Kyoto shi Eisei Kenkysho Nenpo (Annu. Rept. Kyoto Prefect Inst. Public Health), vol. 1973:101-104, March 1975. 4 refs.*

Air pollution due to hydrogen sulfide and carbon disulfide from a plant, manufacturing nylon and rayon was investigated. The plant was operated for 24 hours and was situated in a congested urban area. Complaints were frequent. Both hydrogen sulfide and carbon disulfide were emitted from 50 chimneys from caustic soda cleaning process and from 9 scrubbers which were more efficient in eliminating hydrogen sulfide. Monitoring spots were chosen 0.5 km, 1.0 km and 2.0 km, from the plant. Checks were made downwind in May, June, August, September, December, 1973 and February, 1974. Odor spread to 0.5-2.0 km from the plants. The odor was less as the distance from source increased. There was a significant correlation between concentrations of hydrogen sulfide and of carbon bisulfide.

56711 **APTIC NO. 81335**

Sema, T., K. Hoshizawa, K. Sonoda, K. Koyata, and H. Tashiro

SIMILARITY OF COMBUSTION STATUS AND FLUE GAS PROPERTIES BETWEEN MODEL AND UTILITY BOILERS. *(Kogata nensho shikenro to hatsudenyo boira tono nensho jokyo oyobi haigasu seijo no soji). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Daiichi Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. (No. 1) Electric Power Ind., Rept.), no. 74080:1-25, June 1975. 5 refs.*

Using a model furnace (output 350 MW, 1/7 in size, 1/50 in capacity) developed for the purpose of investigating unsteady combustion phenomena and to obtain data for nitrogen oxides control, the similarity of combustion status (flame temperature, heat flux) and flue gas properties (NOx and dust concentrations) between model and utility boilers was investigated. Geometrical conditions were satisfied as much as possible, and the emphasis was placed on the mixing properties of fuel spray and air for combustion, combustion environment and fuel spray characteristics. Results of combustion tests are as follows. Variations in NOx and dust concentrations with oxygen concentration and burner gun position were similar between model and utility boilers. However, NOx concentration varied with resister damper opening only in the case of model boilers, which was presumably attributable to the difference in burner number. Variations in flame temperature, heat flux and flue gas temperature with O2 concentration and burner gun position were also similar. However, the effect of resister damper opening was observed only in the case of model boiler. The combustion status in the case of swirled combustion air can be expressed by swirl number. The effect of swirl number was more promising in the case of the model boiler due to the difference in burner number.

56712 **APTIC NO. 81420**

Shaw, Glenn E.

OBSERVATIONS OF TWO STRATOSPHERIC DUST EVENTS. *J. Appl. Meteorol., 14(8):1619-1620, Dec. 1975. 6 refs.*

Observations of two recent volcanic eruptions (Volcan del Fuego in Guatemala, Oct. 1974 and Ngauruhoe in New Zealand, Feb. 1975) are reported. The eruptions populated the stratosphere with sufficient ash to create large-scale stratospheric dust veils. Optical effects ontwilight sky radiance, apparently created by the eruption of Fuego, were observed at College, Alaska, 3 mo after the eruption. In lower latitudes the Fuego dust veil effects peaked and then declined 1 or 2 mo following the eruption. The Fuego dust veil underwent northerly meridional transport in winter and spring. On March 20, 1975, a strong volcanic twilight was observed at Mauna Loa, Hawaii. Lidar echoes showed the presence of a two-layer dust cloud. This episode was caused by dust from Ngauruhoe that was mixed across the Hadley cell circulation system from the Southern Hemisphere. (Author abstract modified)

56713 **APTIC NO. 81142**

Shephard, R. J.

PERSPECTIVE ON AIR POLLUTION: THE CANADIAN SCENE. *Can. Family Physician, 21(8):67, 69-73, Aug. 1975. 21 refs.*

Canada has significant air pollution problems despite the large ratio of land mass to population, some being due to the cold climate, the long arctic nights, and a mineral based economy. Routes of intoxication include the respiration of polluted air and the secondary contamination of food and water. The principal air pollutants, in terms of emitted tonnage, are carbon monoxide, sulfur dioxide, hydrocarbons, particulates, and oxides of nitrogen. Sources of these are discussed. Possible criteria for deciding what constitutes an acceptable level of pollution include mortality, acute morbidity, physiological threshold, subjective threshold, and esthetic threshold. Difficulties with the epidemiological approach to defining air quality criteria include lack of accurate data, uncertainty about the phase lag between exposure and response, and interfering variables. The physiological approach must contend with a wide range of population responsiveness. Studies of the relationship of pollutants to health in various parts of Canada are reported. Ontario air quality criteria are compared to the concentrations of pollutants in Montreal, Toronto, and Hamilton. The major problem in these three cities is with oxidants. (Author abstract modified)

56714 **APTIC NO. 78055**

Smoot, L. Douglas

CAUSES OF IONIZATION IN ROCKET EXHAUSTS. *J. Spacecr. Rockets, 12(3):179-183, March 1975. 12 refs.*

Factors affecting ionization in solid propellant rocket exhausts were examined during 49 radar attenuation tests at X-band frequency using 1-pound solid propellant charges in an altitude facility at ambient pressures of 280 and 140 mm (mercury). Transverse attenuation was measured along the exhaust plume with a moving microwave cart. Ionization level and attenuation increased strongly with increasing aluminum levels and generally with decreasing solids-loading levels. Attenuation varied approximately as the square root of the potassium level for the ambient pressures tested. Predicted peak attentuation levels using a model based on equilibrium thermal ionization of alkali metals during plume-air afterburning were remarkably precise. The model accurately predicted the dependence of aluminum level, solids-loading level, and alkali metal level, implying that thermal equilibrium exits for these test conditions to an altitude of 40,000 ft. (Author conclusions modified)

56715 **APTIC NO. 81703**

Somers, Joseph H.

AUTOMOTIVE SULFATE EMISSION DATA. *Environ. Health Perspect., vol. 10:15-28, April 1975. 16 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

Work directed at obtaining sulfate emission factors for cars with and without catalyst is discussed. While some investigations have found significant sulfate formation in noncatalytic cars, others have found only trace levels from noncatalyst cars. The higher levels were obtained using a different measurement method which has not been sufficiently validated for mobile sources. Overall, the bulk of available data show very low sulfate emissions from noncatalyst cars. The investigations agree that much higher quantities of sulfate are emitted from catalyst cars. Pelleted catalysts have much lower sulfate emissions over the low speed Environmental Protection Agency Federal Test Procedures than monolith catalysts. However, preliminary data also show that at higher speeds both catalysts have similar sulfate emissions. This is probably due to temporary storage of sulfates on the catalyst due to chemical interaction with the alumina pellets. (Author abstract modified)

56716 **APTIC NO. 81711**

Stauff, Joachim and Hartmut Fuhr

EXCITED MOLECULES IN THE SOOT OF EXHAUST GASES FROM A COMBUSTION ENGINE. *(Angeregte Zustaende im Russ aus Abgasen einer Verbrennungskraftmaschine). Text in German. Staub, Reinhaltung Luft, 35(10):372-373, Oct. 1975. 8 refs.*

Chemiluminescence of the exhaust gases of a 4-stroke spark-ignition engine within an emergency power unit was observed in an observation system totally shielded from external light. While no chemiluminescence was observed at idle, it appeared under load, and its intensity increased with increased engine load. The chemiluminescence intensity attenuated with time according to an exponential function, and was still measurable after 1 hr. The chemiluminescence was due to substances present in the soot emitted. These molecules had a lifetime of 16 min, and were able to transfer energy to other molecules, a phenomenon which may account for the increased activity of potentially carcinogenic substances. The findings indicate that it is not sufficient to study engine exhaust a long time after emission.

56717 **APTIC NO. 74512**

Suketa, Yasunobu, Shoichi Shimokawa, and Takeo Yamamoto

STUDIES ON ENVIRONMENTAL POLLUTION BY FLUORIDE. II. DETERMINATION OF FLUORIDE IN SOIL. *(Fukka butsu ni yoru kankyo osen ni kansuru kenkyu. Dai 2-ho. Dojo chu fusso no teiryo ho no kento). Text in Japanese. Eisei Kagaku (J. Hyg. Chem.), 21(2):89-92, 1975. 20 refs.*

The determination of fluorine in soil by a fusion and distillation technique is described along with measurements near an aluminum smelting plant. The final determination of fluoride ion in the distillate was made the Alizarin-Lanthanum complexation or the Thorium Neothorium Method. Sodium carbonate and zinc oxide were used for the fusion of the soil sample, and nearly 100% fluorine recovery was obtained by the fusion of 1:2:3 (weight/weight) mixture of soil sample, sodium carbonate, and zinc oxide, respectively, at a fusion temperature between 600 and 1000 C. The recovery showed good repeatability. The fused material was then suspended with sulfuric acid solution and distilled. If the distillation was made a temperature between 135 and 145 C which gave a sulfate ion concentration less than 100 ppm in the distillate both the Alizarin-Lanthanum Complexation and the Thorium Neotheorium method could be used to determine the fluoride ion in the distillate without interference. Soil samples collected around an aluminum smelting plant showed decreasing fluorine levels at increasing distances from the plant. The fluorine levels were 435 ppm, 322 ppm, and 146 ppm for soil samples collected that 1.5 km, 3.5 km, and 5.0 km, respectively, from the plant.

56718 **APTIC NO. 81241**

Sutter, Ernst

DIESEL ENGINES IN TUNNEL CONSTRUCTION - MEASUREMENT OF SOME EXHAUST GAS COMPONENTS IN THE AIR. *(Dieselmotoren im Tunnelbau - Messung einiger Abgaskomponenten in der Luft). Text in German. Staub, Reinhaltung Luft, 35(11):406-408, 1975. 1 ref.*

The concentration of the principal components of diesel engine exhaust gases was measured at different tunnel construction sites in Switzerland. The diesel oil used contained 0.2% sulfur. The sulfur dioxide concentrations in the air were consistently below 0.02 ppm, and the carbon dioxide concentrations were always below 1000 ppm. The nitrogen dioxide concentration, accounting for less than 10% of the total nitrogen oxides, was very low. The nitric oxide, carbon monoxide, hydrocarbon (methane), soot, and dust concentrations were 1.5-3.5 ppm, below 10 ppm, 5-20 ppm, 0.5-1.5 mg/cu m, and 0.5-1.5 mg/cu m, respectively. The respirable dust fraction was 10%. The average load of the diesel engines used at the underground construction sites was 13-14%. The NO concentrations measured in the respiration zone of equipment operators were between 0.5 and 1.2 ppm. The ventilation capacity should be at least 5 cu m/min average effective HP.

56719 **APTIC NO. 74706**

Tamura, Masaru and Yoshimitsu Henda

EMISSION LABORATORY IN THE HIGASHIFUJI TECHNICAL CENTER. *(Higashifuji kenkyusho no haiki kankei jikken shisetsu). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 29(5):426, 1975.*

The emission lab in the Higashifuji Technical Center of the Toyota Automobile Co. is described. The center performs both auto engine dynamometer tests and automobile dynamometer tests. The tests are intended to examine the durability of engines as well as engine performance regarding exhaust gases. All dyanamometer tests are controlled from a separated controlling room utilizing computers, and the data are processed and analyzed by computers. The temperature and humidity in the lab. are kept constant to 22.5 + or - 2 C and 75 + or - 5 grains/lbs of dry air, respectively, in order to avoid the effect of these variables on the experimental data.

56720 **APTIC NO. 77626**

Tillman, Donald C. and Robert S. Horii

CLEAN AIR EQUALS DIRTY WATER. *Proc. Am. Soc. Civil Engrs., J. Environ. Eng. Div., 101(EE1):87-90, Feb. 1975. 2 refs. (Presented at the American Society of Civil Engineers, National Water Resources Engineering Meeting, Los Angeles, Calif., Jan. 21-25, 1974.)*

The systems integrated approach to a clean environment is discussed. Additional sewer capacity allows an area to grow and may contribute to increased air pollution. The Environmental Protection Agency requires all states to review the air pollution effects of shopping centers, commercial developments, sports areas, amusement parks and drive-in theatres before issuing construction permits for such facilities. Other potential pollutants are industrial, residential, and institutional developments; recreational areas; highways; water and sewer lines; and utility lines. Development means more traffic and growth which in turn creates more smog. A systems integrated approach rather than singular bureaucratic pursuits, such as clean air at the cost of all environmental needs is required.

56721 **APTIC NO. 81576**

Tsuyuki, Tamotsu

PHOTOCHEMICAL AIR POLLUTION AND HYDROCARBONS. *(Kokagaku taiki osen to tanka suiso rui). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 35:39-54, Sept. 1975. 9 refs.*

The status of photochemical air pollution is reviewed based on the data compiled during the period of 1970-1974 concerning the number of photochemical smog afflicted people registered and number of oxidant warnings issued in 23 prefectures. The relationships between photochemical air pollution and hydrocarbons are discussed with descriptions of photochemical reactions and formation mechanisms of ozone, nitrogen dioxide, peroxyacetyl nitrate, peroxides and others. The formation mechanism of oxidant is reviewed with results of smog chamber experiments. Photochemical reactivities of various

HCs evaluated by the Agency of Industrial Science and Technology, TokyotChiba Pollution Research Institute and Battelle Memorial Institute are given. Data on the contribution rate of each type of HC emission source are compiled and analyzed. The HC emission control measures form stationary pollutant sources and its trends are also described.

56722 **APTIC NO. 81410**

Winnett, George and Marie Siewierski

AIR SAMPLE STUDIES FOR MEASUREMENT OF PESTICIDE CONTAMINATION FROM STORAGE AREAS. *Bull. Environ. Contamination Toxicol., 14(6):681-686, Dec. 1975. 3 refs. (Presented at the American Mosquito Control Association Meeting, Annual, 30th, Anaheim, Calif., Feb. 23-27, 1974.)*

The possibility of contamination of nearby buildings with pesticides from a pesticide storage building was studied. Nylon screens were used for sampling inside the storage building and outside nearby buildings. Malathion was the only pesticide measured, and a gas chromatograph was used for analysis. The screens were exposed for 1, 3, and 7 days. The concentration of pesticide vapors in the air within the storage building was relatively great. The relative concentration of malathion was indirectly proportional to the distance from the storage building. Whether the indoor levels of malathion constituted a health hazard was up to question since it was impossible to calculate the actual concentration of the pesticide in the air, but grounds for suspicion have been laid.

56723 **APTIC NO. 81722**

Yamaguchi, Takaaki and Ikutoshi Matsumura

EVAPORATION OF HYDROCARBONS AND PREVENTIVE MEASURES. *(Tanka-suiso no johatsu to boshi taisaku). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan) (Tokyo), 54(582):794-808, Oct. 1975. 3 refs.*

The present status of hydrocarbon emission regulations, sources, amounts, and control measures in Japan is surveyed. The prefectures of Kanagawa, Tokyo, Osaka, Aichi, Mie, have regulations governing storage facilities for hydrocarbons (crude oil, naphtha, jet fuel, solvents, gasoline, paints, fuel oil, lighting oil, volatile oil, organic chemical). In 1975, in Japan, facilities for petroleum distillation treated 837,000 kl/day; petroleum quality improvement, 86,000 kl/day; petroleum decomposition, 58,000 kl/day. Projected amounts include distillation, 880,000 kl/day (1976); 1,040,000 kl/day (1979); improvement, 88,000 kl/day (1976); 95,000 kl/day (1979); decomposition, 61,000 kl/day (1976); 96,000 kl/day (1979). Refinery storage facilities are generally of the floating roof tank type, which is superior to the cone roof type in preventing hydrocarbon loss by volatilization. At points of transfer, use of equipment designed for vapor return or vapor recovery can minimize loss into the atmosphere.

56724 **APTIC NO. 81227**

Yamanaka, [illegible], Hiroshi Hirose, Kazuhei Hashimoto, Yuko Honda, Susumu Takada, and Senzo Kawai

STATIONARY SOURCES AND EMISSION FACTORS FOR NITROGEN OXIDES. *(Chisso sankabutsu no hassei shisetsu to haishutsu keisu). Text in Japanese. Kogai To Taisaku (J. Pollution Control), 11(11):1229-1233, Nov. 1975. 2 refs.*

Emissions of nitrogen oxides from stationary sources (boilers, incinerators, and furnaces) in Kyoto were surveyed. Concentrations of emitted NOx were dependent on the amount of exhaust gas (N cu m/hr), and kind of fuel. For a boiler using lighting oil as fuel increases in load (%) cause increased concentrations of NOx (55%, 78.7 ppm; 70%, 77.7 ppm; 90%, 104 ppm; 100%, 106 ppm). In installations using C grade heavy oil with wet-type stack desulfurization units, almost no effect on emissions of NOx was found. At furnace temperatures above 1000 C, formation of NOx increased sharply. When boiler stack emissions were small-scale (about 10,000 N cu m/hr), emitted concentrations of nitrogen oxides varied greatly with the type of fuel (heavy oil C grade, 250 ppm; heavy oil A grade, 70 ppm). Emission factors for total emission regulation calculations can vary from 0.16 to 55.4, and require much data collection.

56725 **APTIC NO. 81208**

Yamashita, Kenichi, Osamu Shinozaki, and Shigeru Yanahara

PARTICLE SUBSTANCE CONTAINED IN AUTO EXHAUST. *(Jidosha no haiki gasu chi ni fukumareru ryushijyo busshitsu). Text in Japanese. Preprint, the Chemical Society of Japan, Tokyo, p. 13, 1975. (Presented at the Japan Chemical Society Powder Symposium, 13th, Nov. 19-21, 1975.)*

A study was conducted by the Mechanical Technology Research Laboratory of the Agency of Industrial Science and Technology on the granular substances contained in auto exhaust gas. The major objectives of the study were to establish an analytic method for granular metal compounds, and to understand the characteristics of these granular substances in order to prepare basic information for air pollution control. A dilution sampling device was made, in which the exhaust gas was introduced and diluted in dry purified circulating air for analysis of the granular substances in the diluted dry gas. The sampling process and analytic method for various characteristics of the sampled substances were investigated. The following plots were made: fuel consumption versus speed of the test auto, fuel consumption versus concentration of granular substances, speed of the auto versus the change in concentration of particles, difference in concentration of particles measured by various analyzers and the distribution of the diameter of the particles in relation to the speed of the auto.

56726 **APTIC NO. 78926**

Yoshimitsu, Y., H. Yokoyama, Y. Yamagata, A. Nagatomi, I. Tsuchitori, H. Suzuki, A. Nitta, and M. Kashiro

LEAD FUME OCCURRENCE AS A TOXIC SUBSTANCE AND EFFECTS ON THE WORKING ENVIRONMENT. *(Yugai busshitsu to shiteno namari fumu no hassei to sagyo kankyo ni tsuite). Text in Japanese. Kure kogyo shikenjo hokoku (Rept. Kure Ind. Res. Inst.), no. 18:77-82, Aug. 1975. 3 refs.*

Lead metal was melted in an iron melting furnace 67 mm in inside diameter and 189 mm in depth, using an electric heater. The temperature was maintained at 750 C and 780 C, 800 C, 820 C, and 850 C each for a given period of time. The air above the furnace was sampled at 500 l/min using a high volume sampler with Toyo no. 5A and 5C filter papers. The lead fume formation increased significantly at temperatures higher than 800 C. Addition of charcoal reduced the lead concentration to a great extent. At 850 C, 0.072 mg/hr-sq cm and 0.535 mg/hr-sq cm of Pb were detected with and without the addition of charcoal, respectively. High power dust collectors and good hoods and ducts as well as a closed system for the quenching solution were recommended as safety measures.

56727 **APTIC NO. 81699**

Zeller, M. V.

INSTRUMENTAL TECHNIQUES FOR ANALYZING AIR POLLUTANTS GENERATED IN TEXTILE PROCESSING. *Text. Chem. Color., 7(1):33-37, Jan. 1975. 10 refs.*

Sampling methods for both solid and gaseous pollutants in the textile industry are reviewed. Lint and fibrous material are collected on a membrane filter and then analyzed by microscopic methods. Birefringence determinations employ a polarizing microscope and provide a very specific method of identifying fibers. Atomic absorption is used to determine metals arising from airborne dirts or salts generated from agitation in textile processing. Infrared analysis is used to identify and quantify vapors at their toxic concentrations, usually in the ppm range. The use of long-path gas cells and compensation analysis

procedure permits these types of sensitive analysis. Gas chromatography is capable of analyzing mixtures of solvent or chemical vapors. The major advantage of gas chromatography is its ability to separate as well as identify vapors or liquids. (Author abstract modified)

56728 **APTIC NO. 81038**

Zeltner, Erich

DRYING AND COMBUSTING SEWAGE SLUDGE IN SELF-SUSTAINED UNITS - ECONOMICAL, ENERGETICAL AND ENVIRONMENTAL CHARACTERISTICS. *Von Roll Ltd., Zurich (Switzerland), Environmental Engineering Div., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 377-383. (Nov. 3-5.)*

A dust incinerator used in the incineration of sewage sludge is described. The dust incinerator consists of a dust burner and a combustion chamber. The incineration of dried powder from the dryer-grinder takes place at 800-850 C. Since the dryer requires hot gases of 550 C maximum, the combustion gases from dust incineration are mixed with cool vapors from the dryer. The dust incineration has a very simple and sturdy design. The dried sludge in the form of powder is metered into the primary air flow by means of a screw with variable speed and blown into the combustion chamber. Dried sludge ignites instantaneously above 650 C and burns off very quickly.

56729 **APTIC NO. 75361**

Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

SUPPLEMENT NO. 4 FOR COMPILATION OF AIR POLLUTANT EMISSION FACTORS. *Rept. AP-42, 65p., Jan. 1975. 33 refs.*

Air pollution emission factors are presented for various industrial and non-industrial emission sources. The sources include: external combustion processes, solid state disposal by incineration, open burning, internal combustion engines (mobile and stationary), surface coating operations, dry cleaning operations, petroleum distribution, the chemical processing industry, and the wood products industry. Pollutants considered include: sulfur oxides, carbon monoxide, hydrocarbons, nitrogen oxides, particulates, aldehydes, and sulfuric acid mist. The data are intended as a supplement to the document Compilation of Air Pollutant Emission Factors which was published by the Environmental Protection Agency in February 1972.

56730 **APTIC NO. 81438**

YEAR 1976 TOO SHALL BE GOOD FOR DRIVING. DIN 51 600 AGREEMENT ON GASOLINE QUALITIES-REGULAR MAINTENANCE REQUIRED. *(Auch 1976 soil gut Fahren sein. Mit DIN 51 600 auf Benzinqualitaeten geeinigt - Regelmaessiger Wartung erforderlich). Text in German. VDI (Ver. Deut. Ingr.) Nachr. (Berlin), 29(48):6, 1975.*

The anticipated impact of reduced lead content in gasoline, to be introduced in West Germany on January 1, 1976, is discussed. The lead content will be reduced to 0.15 g/liter according to DIN 51 600. To avoid an unacceptable drop in the octane number, the production of components with high octane numbers has to be stepped up. Smooth operation of both old and new automobiles is guaranteed with proper adjustment and maintenance. New models have reduced compression ratios because of the lower lead content. The reduced lead content will lead to an increase in the gasoline price by about 2 cents/liter, and in the gasoline consumption by 2%.

56731 **APTIC NO. 81690**

Technical Research Institute for Energy and Environment (Japan)

DEMONSTRATIVE STUDIES BY FULLY-AUTOMATED SIMULATOR OF THERMAL POWER PLANTS. *(Karyoku hatsudensho sogo sen hidoka shimureita ni yoru jissho kenkyu). Text in Japanese. Denkenho (Rep. Inst. Electr.), no. 37:4-10, July 1975.*

New large capacity thermal power generators are operated automatically by the use of computer controls. The necessary information for generator operation, procedures, and various other data are fed into the computer and analyzed and instructions for optimum operating conditions and control procedures in the case of emergency are dispatched. Descriptions of logical decision and command systems for generator operation, which consists of adaptive control, optimum planning, automatic action command in the case of accident, and program implementation are given. Descriptions of automated simulators consisting of logical decision and command systems, process input-output systems, operation monitoring disks, control disks, transmission terminal disks, and equipment characteristics simulators are also given.

1974

56732 **APTIC NO. 81190**

Bach, Wilfrid

ENERGY CRISIS AND AIR QUALITY. *(Energiekrise und Luftqualitaet). Text in German. Tech. Umweltmag., no. (6):42-43, Nov./Dec. 1974.*

The causes and consequences of the 1973 energy crisis in the USA are discussed. As the Middle East countries supply only 11% of the oil consumed in the USA, the energy crisis in the USA was due to a basically false energy policy (increasing use of unnecessary energy-squandering devices and appliances and of high-powered automobiles with energy-consuming extras) rather than to the oil export limitations imposed in the Middle East. The energy conservation plan announced on Oct. 12, 1973 in Wasington calls for the economic and restricted use of all forms of energy, and thereby it might lead to a reduction of air pollution. On the other hand, power plants are not required to switch to oil from coal, and the industrial emission standards have been suspended, which may outweigh the above reduction, especially in terms of sulfur dioxide and dust emissions. The use of compact and subcompact automobiles without energy-consuming extras, car pools, the use of black-and-white television instead of color television, and of refrigerators without freezer compartment, the abandonment of many electrical household appliances, improved thermal insulation of buildings, lower speed limits, and lower thermostat settings, and a more efficient and economical use of energy in industries are seen as the most effective steps toward the solution of the energy crisis.

56733 **APTIC NO. 81540**

Hluchan, E., M. Jenik, and A. Rippel

THE INFLUENCES OF THE EMISSIONS FROM A POWER PLANT ON THE CHEMICAL COMPOSITION OF DUST FALL-OUT. *(Vplyv exhalatov z elektrarne na chemicke zlozenie prasneho spadu). Text in Czech. Cesk. Hyg., 19(9):409-413, 1974. 7 refs.*

The elemental composition of dust fallout near a power plant was analyzed. Significantly increased amounts of manganese and lead were found, with values ranging from 9.2-1542.6 and 10.8-588.4 kg/sq km/yr, respectively. Chromium, zinc, nickel, and cadmium were increased to a lesser extent.

56734 **APTIC NO. 78501**

Jaksch, John A.

THE WASTE OIL INDUSTRY: A DISCUSSION OF SOME ISSUES TO CONSIDER IN PERFORMING AN

ECONOMIC ANALYSIS. Association of Petroleum Re-Refiners, Waste Oil Recovery Reuse, Proc. Intern. Conf., Washington, D. C., 1974, p. 395-404. 5 refs. (Feb. 12-14.)

Economic and environmental considerations involving the waste oil industry are discussed. An estimated 1 billion gallons of waste oil are produced annually, with 100 million gallons being re-refined and/or reprocessed. 200 million gallons used as road oil for dust control, and an unknown percentage burned. The burning of waste crankcase oil which contains high concentrations of lead results in the emission of submicron particulates which contain the toxic metal. Technical factors and costs associated with minimizing the risk to human health resulting from waste oil burning need to be evaluated. The use of waste oil for dust control on roadways is another source of pollution either via volatilization, water runoff, or transport on dust particles. Economic determinations of the value of this type of dust control versus the additional pollution created are needed.

56735 **APTIC NO. 73155**

Jennett, J. Charles, E. Bolter, N. Gale, W. Tranter, and M. Hardie

THE VIBURNUM TREND, SOUTHEAST MISSOURI: THE LARGEST LEAD-MINING DISTRICT IN THE WORLD--ENVIRONMENTAL EFFECTS AND CONTROLS. *Preprint, Inst. of Mining and Metallurgy, London (England), Inst of Quarrying, and Inst. of Mining Engineers, 14p., June 1974. 6 refs. (Presented at the Minerals and the Environment Symposium, London, England, June 4-7, 1974, Paper 4.)*

The sources of lead and other trace metals in the soil, water, and biological systems of the Viburnum Trend of southwest Missouri are described. The most obvious source of Pb emissions to the soil is the region's Pb smelter. Its 200 ft main stack discharges a baghouse effluent at an average rate of 28.5 lb/hr of total particulates, of which 5.1 lb/hr is particulate Pb under normal operating conditions. The deposition rate for this Pb near the smelter is as high as 2 g/sq m/mo, decreasing to background levels of 0.5 g/sq m/mo within 3 mi. Fugitive sources exist such as trucking, hauling, and railroad transportation of ore concentrates and windblown dusts from concentrate piles and tailings dams. Fugitive sources are the major source of deposited Pb near the smelter. Further out, stack emissions are the prime contributor of Pb to the soil.

56736 **APTIC NO. 74258**

Kay, R. W.

A SURVEY INTO THE FUMES EVOLVED FROM FOUNDRY SAND BINDERS BASED ON SYNTHETIC RESINS. *Brit. Foundryman, 67(1):1-4, Jan. 1974. 9 refs.*

A field assessment of the fumes evolved from the curing and decomposition of organic binding agents (synthetic resins) used in foundry moulds was conducted by sampling the fumes at several stages in the foundry process at 17 different foundries. The most widespread fume problem in core and mould making processes based on sand/synthetic resin mixtures was caused by the cold-set process in which resins with contain-free formaldehyde were used. Forced ventilation was necessary to protect the worker from irritant formaldehyde fumes. Cold cure processes based on an oil and isocyanate mixture did not appear to present any toxic problems during normal foundry work. New cold box processes using triethylamine as a gaseous curing agent for a resin/ isocyanate mixture required either good local ventilation during the gassing stage or the removal of fumes by an acid scrubber. The isocyanate component of the resin did not appear to present a toxic problem during mixing, curing, and subsequent decomposition of the resin by molten metal. Hot box processes produced high concentrations of formaldehyde fume, and shell moulding processes resulted in undesirable levels of ammonia, phenol, and formaldehyde; good forced ventilation was necessary for both of these operations. (Author conclusions modified)

56737 **APTIC NO. 71642**

Kozyr, N. P., A. Y. Chebanov, and B. P. Titomer

PROPERTIES OF GASES AND DUST GENERATED BY TITANIUM SLAG SMELTING IN CLOSED ORE-SMELTING FURNACES. *(Svoystva gazov i pyli plavke titanovykh shlakov v zakrytykh rundnotermicheskikh pechakh). Text in Russian. Tsvetn. Metal., no. 11:52:53, Nov. 1974. 6 refs.*

The physical and chemical properties of flue gases and dust generated by titanium slag smelting in closed ore-smelting furnaces were studied for the optimization of the flue gas cleaning process. The gases, emitted at a temperature between 400 and 800 C, had dust concentrations ranging from 6 to 60 g/N cu m. Chemical analysis revealed that the dust, with a specific gravity of 3.5 g/cu cm, is composed of 29.7% titanium dioxide, 56.2% ferric oxide, 4.6% alumina, 19% silica, 4.88% chromium trioxide, 0.61% vanadium pentoxide, 4.44% manganese dioxide, 0.74% calcia, 2.34% magnesia, 2.41% carbon, and 0.6% sulfur. Thus, the dust captured can be recycled in the smelting process. The dust was composed mainly of particles in a size range of 1-15 micron. The electric resistivity was 17,500,000,000 ohm/cm. The findings indicate that electrostatic precipitators are unsuitable for the capture of the dust due to its high resistance, and that tissue filters are most appropriate.

56738 **APTIC NO. 81269**

Moore, R. E. and C. J. Barton

RADIATION DOSES FROM HYPOTHETICAL EXPOSURES TO COMBUSTION PRODUCTS OF PLOWSHARE GAS DISCHARGED FROM STACKS. *Nuclear Technol., vol. 24:238-245, Nov. 1974. 21 refs.*

Whole body annual radiation doses to humans resulting from hypothetical exposures to combustion products of plowshare gas (natural gas from well stimulated by nuclear explosives) were estimated for stack gases discharged from the Cherokee Steam Electric Station in the Denver, Colorado area. The plant was assumed to burn 94 million cu ft/day of nuclearly stimulated natural gas containing 10 picocuries of tritium. The highest dose that any person outside the plant area might be exposed to was estimated to be 0.006 mrem/yr. This predicted dose included 0.005 mrem/yr from the initial exposure to stack plumes and 0.001 mrem/yr for exposure to residual tritium repeatedly swept over the area by wind reversals which occur almost daily in the Denver area. The total estimated dose to the nearby population of 1.55 million people was estimated to be 3.0 man-rem/yr, with 1.6 man-rem/yr being attributable to the initial plume exposure and the balance being attributable to wind reversals.

56739 **APTIC NO. 73116**

Moyer, Brian R. and Thomas F. Budinger

CADMIUM LEVELS IN THE SHORELINE SEDIMENTS OF SAN FRANCISCO BAY. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 127-135. 31 refs. (June 11-13.)*

Cadmium levels in the low tide shoreline sediments of San Francisco Bay were measured at 68 locations. Sample cores of 5.5 cm diameter and 10 cm depth were separated into top and bottom fractions and analyzed by atomic absorption spectrophotometry. The mean cadmium values in the top and bottom fractions (dry soil) were 1.22 + or - 0.99 ppm and 0.93 + or - 0. 74 ppm, respectively. The mean value for all the 10 cm cores of San Francisco Bay peripheral muds was 1.07 + or - 0.89 ppm. The top fraction cadmium content was 1.5-2 times more concentrated than the bottom fraction except in the northeast sector of the bay where the surface muds were better mixed; here the average cadmium content was 1.5 times that of other sectors. This higher cadmium level was associated with the proximity of a lead smelter and several petroleum refineries. Concentrations of greater than 2 ppm were found in

13% of the samples, indicating recent pollution. (Author abstract modified)

56740 APTIC NO. 81271

Natusch, D. F. S., J. R. Wallace, and C. A. Evans, Jr.

TOXIC TRACE ELEMENTS: PREFERENTIAL CONCENTRATION IN RESPIRABLE PARTICLES. *Science, vol. 183:202-204, Jan. 18, 1974. 12 refs.*

Analyses of fly ash samples collected from eight power plants in the United States revealed that the toxic trace elements arsenic, antimony, cadmium, lead, selenium, and thallium were most concentrated in the smallest respirable particles emitted from coal-fired power plants. A possible explanation for this particle size distribution is that the above elements or their compounds are volatilized during combustion and preferentially adsorb or condense onto the small particles which most easily pass through conventional control equipment. If this hypothesis is correct, then the preferential adsorption of volatile species onto large, easily collected particles of a heat-stable molecular sieve entrained with feed air may provide an effective way to control toxic trace element emissions.

56741 APTIC NO. 81539

Strecha, M. and I. Bzduch

ATTEMPT OF DETERMINING THE EFFECT OF URBANIZATION, INDUSTRY AND TRANSPORTATION ON THE SOOT FALL-OUT IN BRATISLAVA CITY. *(Pokus o urcenie vplyvu urbanizacie, priemyslu a dopravy na spad sadzi v Bratislave). Text in Czech. Cesk. Hyg., 19(9):405-408, 1974. 3 refs.*

The relative effects of urbanization, industry, and transportation on soot fall in Bratislava, Czechoslovakia were investigated. A statistical analysis revealed that 48% of the soot fall was due to urbanization. Industry accounted for 46%, and transportation accounted for only 6%. The relatively small influence of transportation on soot fall appeared to be due to the scarcity of motor vehicles in comparison with industrial and domestic sources of pollution.

56742 APTIC NO. 81355

van der Krooij, J. and A. J. Eishout

OXIDES OF NITROGEN MEASUREMENTS IN POWER PLANTS IN THE NETHERLANDS. *(NOx-Messungen in den niederlaendischen Kraftwerken). Text in German. Elektro Techniek (The Hague), 53(6):314-319, May 1974. 10 refs.*

The emission of nitrogen oxides from Dutch power stations was investigated. There was a relatively constant emission of 60,000 g/a in the years 1968-1973. The NOx emissions from natural gas-fired boilers operated in the Netherlands were less than those in the United States. This is due to a difference in furnace thermal load, calcrific value of the natural gas, and the excess air. The various factors influencing the formation of NOx in furnaces are discussed and the formation of fuel-NOx in oil and coal-fired boilers is illustrated.

56743 APTIC NO. 74690

Kitakyushu Municipal Inst. of Environment and Public Health (Japan)

REPORT OF KITAKYUSHU MUNICIPAL INST. OF ENVIRONMENT AND PUBLIC HEALTH, NO. 1. *(Kitakushu-shi kankyo eiseisho kenkyu hokoku). Text in Japanese. 82p., 1974.*

Measurement results of air pollutants and odors at various locations in Kitakyushu were given. Sulfur oxides concentrations measured at 32 locations in 1972 ranged from 1503 sulfur trioxide mg/100 sq cm/day at the Hitachi Metal Co. to 0.343 SO3 mg/100 sq cm/day at the Anayo water treatment plant. Dust concentrations at the same locations ranged from 28.5 tons/sq km/mo at the Okazaki Industrial Co. to 7.4 tons/sq km/mo at the Takaki Elementary School. Hydrogen chloride concentrations at 19 chemical plants ranged from 59.3 mg/N cu m to 0.9 mg/cu m. Ammonia concentrations were high at hog-farms and poultry-farms, while hydrogen sulfide concentrations were high at animal-feed plants and chemical plants. Methyl mercaptan concentrations ranged from 11 ppb on June 16, 1973 at D chemical plant to 0.08 ppb on Sept. 20, 1973 at A chemical processing plant. A total of 321 measurements on SOx, 317 measurements on dust, 101 measurements on airborne particulates, and 25 measurements on odors were conducted in 1972 by the Kitakyushu Municipal Inst. of Environment and Public Health.

56744 APTIC NO. 74815

TOUR OF SUMITOMO CHEMICAL INDUSTRIES, INC. NIIHAMA PLANT. *(Sumitomo Kagaku Kogyo Kabushiki Kaisha, Niihama seizosho kengakuki). Text in Japanese. Ryusan To Kogyo (Sulfuric Acid Ind.), 27(10):195-197, Oct. 1974.*

A tour of the Niihama Sulfuric Acid Manufacturing Plant of Sumitomo Chemical Industries is described. In 1913, Sumitomo established a fertilizer plant in the area. Sumitomo had operated a copper refinery, with sulfur dioxide by-product, which was causing pollution problems. Sumitomo, in a pollution control gesture unprecedented in those days, moved the refinery to an island off the coast of Niihama, Japan. Around the time, an industrial sulfuric acid manufacturing process was developed, and Sumitomo, for the sake of pollution control as well as profit, began manufacture of sulfuric acid and calcium superphosphate. Currently, at the Niihama Plant, the SOHIO acrylonitrile method, BASF caprolactam method, Sumitomo DNT, and acrylic acid methods are used in production. Since 1970, Sumitomo has used the double contact process in the manufacture of sulfuric acid. Much of the process is systematized, with active attention given to pollution control. Factory operation is mostly automated, and except for maintenance and inspection, a shift of 4 persons can run the factory from the control room. Nominal capacity is 620 tons/day (98% conversion). A fluidized calcination furnace and a sulfur furnace form the basis of the operations. Combustion gases from the calcination furnace are cleaned by using a hot cyclone. Cinders (containing iron) are sold to ironworks. Hot gases (1000 C) are used to generate steam for use in plant operations. There are 6 units of gas coolers (diameter, 1.7 m; height, 9 m), and 2 Cottrell units (144 tubes per unit). The dust removal rate is 99.8%. Six heat exchanger units recover heat which control reaction temperatures in a final step. Heat balance is possible at 40% load.

56745 APTIC NO. 74997

Muroran Municipal Office (Japan)

POLLUTION MONITORING REPORT FOR MURORAN CITY. *(Muroran-shi no kogai sokutei hokoku). Text in Japanese. 59p., Nov. 1974.*

Pollution monitoring data for Muroran City, Hokkaido, Japan, for 1972 and 1973 are collected in this report. Rapid development in the 1960 s, centering around steelworks, petroleum refining, and cement works, has resulted in air pollution and water quality deterioration. An oil refinery which has a refining capacity of 110,000 barrels/day is in operation. Industrial output from steelworks in 1972 amounted to $512 million, and comprised about 75% of the total output from Muroran City. A municipal air pollution telemetry system, with 27 monitoring locations, has been established at a cost of about $300,000. Air pollution is concentrated in an area about 2 sq km downwind from the factories, out of a total city area of 79 sq km. Emissions of sulfur oxides for 1972 and 1973 have met May 1973 environmental standards about 90% of the time. Carbon monoxide concentrations, measured from April 1973 to March 1974 at a central intersection in the city, have met 8-hour and 24-hour average standard values 100% of the time. Precipitated soot concentrations have not varied much from 1972 to 1973, with average values ranging from 6.1-52.3 tons/sq km/mo. Muroran Harbor was designated as a Type C water region (Environmental Conservation) in March 1973. Water quality environmental standards (for 10 items) have been met since 1971, but there has been a continuous increase in pH (standard, 7.0-8.3) from 7.3-8.3 (Nov. 1970) to 8.0-8.8 (Oct. 1973). Maps, diagrams, and copies of pollution control agreements between the city and industry are included.

56746 **APTIC NO. 75375**

PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio

UPDATING THE NATIONAL EMISSIONS DATA SYSTEM POINT SOURCE INVENTORY (FINAL REPORT). *Office of Air and Waste Management Contract 68-02-1001, Task 5, Rept. EPA-450/3-75-056, 11p., Nov. 1974.*

NTIS: PB 242377/AS

Air Pollution Emissions Reports for 319 point sources in the states of Illinois, Maryland, Michigan, Minnesota, Ohio, Pennsylvania, West Virginia, and Wisconsin are used to update the National Emissions Data System point source emissions inventory. The updating consists of entering new sources in the NEDS and checking existing information in the NEDS against the information in the APERs. Existing information is checked by comparing source emission points for operating rate, design rate, control equipment and efficiency, emission estimates, and other data fields on point source coding forms.

56747 **APTIC NO. 81119**

SO2 REMOVAL--A NEW PROBLEM WITH PLENTY OF SOLUTIONS. *Power, 118(9):2-5, Sept. 1974.*

An estimated 65% of the world s sulfur dioxide emissions emanate from natural sources, which produce a background SO2 level of 2 ppb, or 5.7 microgram/cu m. Increased population, urbanization, and industrialization have greatly increased SO2 levels in the 20th century. Despite dramatic episodes, the greatest impact of air pollution on human health stems from average daily exposure. Illness from SO2 may be acute or chronic. Respiratory symptoms are aggravated by daily exposure to SO2. Sulfur promotes suspended sulfate formation, which is related to illness aggravation. Sulfur dioxide tends to be deposited higher in the respiratory tract than sulfates. Low-level SO2 exposure may subtly affect the body, lowering its resistance. Exposure to 80 and 120 microgram/cu m of SO2 for several days can damage health. But controversy rages over realistic concentrations and times of exposure. The effect of SO2 on vegetation has been thoroughly investigated. Even sensitive plants can withstand 0.05 ppm of SO2 indefinitely, not incurring chronic injury until levels of 0.1 to 0.3 ppm are reached, with acute injury above 0.3 ppm. Means of controlling emissions from coal-fired power plants are discussed. Natural gas is the cleanest fuel, but it is also in shortest supply. Imported fuel is becoming increasingly expensive. Low-sulfur oil is a viable, but not a cheap alternative. Low-sulfur coal is another alternative whose use is not without problems. Removing sulfur from coal before combustion will become increasingly attractive. Solvent refining is described. Coal conversion will probably remain more expensive than stack gas removal of SO2. A chemical reaction between SO2 and limestone occurs in fluidized bed combustion, removing the SO2 from the exhaust gases. Both atmospheric and pressurized fluid bed boilers are under development. Another technique is washing of pyritic coals after pulverization, with gravity separation of sulfur from coal. Intermittent controls depend on precise and ambient SO2 measurements. Measures include fuel switching and power cutback. Uncontrolled burning of high sulfur coal will probably be phased out by 1975.

1973

56748 **APTIC NO. 73466**

Baranowski, J.

MEASUREMENTS OF SOME PHYSICAL MAGNITUDES OF DUST AT ITS SMALL AMOUNTS. *(Pomiary niektorych fizycznych wielkosci pylu przy malych jego ilosciach). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(1):6-17, 1973. 10 refs. (Translated from Polish by A. Dangel, National Center for Scientific, Technical and Economic Information, Warsaw (Poland), Foreign Scientific Publications Department, 12p., 1974.*

NTIS: TT 73-54096/1

Physical measurements involving the apparent density of a layer of shaken dust, apparent density of a layer of stacked dust, angle of stacking, and angle of talus are presented for dusts obtained from steel works, lime works, and sinter sifting. Values for the apparent density of a layer of stacked dust (sifting container volume equal to 1000 cu cm) ranged from 0.130-1.192 g/cu cm; while those for the apparent density of shaken dust (shaking cylinder volume equal to 250 cu cm) ranged from 0.283-1.396. The angle of talus (circular base diameter of 120 mm) ranged from 32.4-45.3 deg, and the angle of stacking (plane size of 290 by 270 mm) varied between 32.0 and 54.9 deg.

56749 **APTIC NO. 81029**

Esplin, G. J., R. S. Serenius, and A. D. McIntyre

MEASUREMENT AND CHARACTERIZATION OF RECOVERY FURNACE PARTICULATES. A STATUS REPORT. *Pulp Paper Mag. Can., no. 12:404-410, Dec. 1973. 8 refs. (Presented at the Canadian Pulp and Paper Association Annual Meeting, 59th, Montreal, Quebec, Jan. 23-26, 1973, Paper T404.)*

The use of a cascade impactor with improved glass fiber filters for the measurement and characterization of recovery furnace particulates in a kraft mill is described. Chemical analyses were carried out on the filter and impinger catches to determine filter collection efficiency and the importance of the sulfur dioxide/sulfur trioxide reaction as regards particulate measurements. Sodium, calcium, and iron were determined using straightforward atomic absorption spectroscopy. Sulfate ion was determined by barious precipitation at pH 4.5 followed by conversion of the precipitate to SO2 with a Leco sulfur furnace. Chloride was determined by visible light attentuation of a silver chloride suspension in a spectrophotometer. Carbonate and total carbon were determined using a Beckman infrared carbon analyzer.

56750 **APTIC NO. 74150**

Jacquemain, R., F. Remy, and C. Galanter

SPECTROCHEMICAL ANALYSIS OF INCINERATION PLANT RESIDUES AND OF ATMOSPHERIC DUST IN BESANCON. *(Analyse spectrochimique des residus de l usine d incineration et des poussieres atmospheriques de Besancon). Text in French. Ann. Sci. Univ. Besancon, Chim. (Besancon), no. 10:89-98, 1973. 13 refs.*

The composition of dust sampled at different points in a waste incinerator plant in Besancon was analyzed and compared with that of settling dust collected at different points in that town. The organic matter content in the incinerator dust ranged from 0.4 to 11.4%, increasing with decreasing temperature in a range of 1050-300 C. The inorganic matter showed rather similar composition regardless of the temperature at the sampling site. Silica accounted for 51%, while the calcium, aluminum, lead, iron, magnesium, and potassium concentrations were in the respective ranges of 7.1-18.7%, 8.5-14.7%, 0.08-0.18%, 0.7-7.6%, 3.1-7.2% and 0.4-2.6%. The inorganic composition of the incinerator dust showed a striking resemblance to that of dust collected in the city, except for the higher lead content in the latter.

56751 **APTIC NO. 81414**

Jensen, W.

AIR AND STREAM IMPROVEMENTS IN THE FINNISH PULP AND PAPER INDUSTRY DURING THE SEVENTIES. *Pulp Paper Mag. Can., 74(12):411-416, Dec. 1973. 3 refs. (Presented at the Air and Stream Improvement Conference, 7th, Vancouver, Canada, Sept. 18-20, 1972, Paper T411.)*

The current status of the Finnish pulp and paper industry related to the environment is described. Legislative and regulatory requirements are outlined, as are current air and stream emission levels. Special legislation on air pollution is in preparation; there are currently no emission standards for industry. Present regulations concerning air pollution are included in the acts on public health and work security. Pulp and paper mills accounted for 45% of Finland's total sulfur emission and 27% of the total emission of particulate matter. Brief descriptions of major research projects at the Finnish Pulp and Paper Research Institute are given. These include methods for determining ambient air quality in the vicinity of mills. (Author abstract modified)

56752 **APTIC NO. 73168**

Noel, R. and W. Duhameau

CONTROL SYSTEM OF INDUSTRIAL POLLUTION IN THE LIEGE INDUSTRIAL BASIN. *(Un reseau de controle de la pollution industrielle dans le bassin industriel Liegeois). Text in French. Ann. Gembloux, 79(2):131-140, 1973.*

The air pollution control network set up in the Liege industrial area in Belgium is described, and results obtained for dustfall by this monitoring network are presented. Each sampling station incorporates a rain gauge which is exposed for 4 wk, at the end of which period the soluble and insoluble fractions, the total dustfall, and the sulfate ion concentration are determined; in addition there is a Vaseline-coated plate for direct dustfall measurement. The dustfall around metallurgical plants amounted to 5 g/sq m/day, and to 1 g/sq m/day around cement works. Pollution peaks between mid-March and mid-April, between mid-May and-June, and in November were established. The soluble fraction amounted to 50% around cement works, to 12% around metallurgical plants, and averaged 40% for Liege. The dustfall data obtained by means of exposed, Vaseline-coated plates were consistently and considerably lower than those measured by means of the rain gauges, which is due to the leachout of the soluble fraction by precipitation. Part of the sulfate ions in precipitation samples originated from sulfate-containing dust. The sulfate content of falling dust amounted to 20% around cement works, and to 10% around metallurgical plants.

56753 **APTIC NO. 81582**

Papic, M. M., A. D. McIntyre, and J. G. Dunsmore

STRIPPING OF H2S AND CH3SH FROM AQUEOUS SOLUTIONS. *Pulp Paper Mag. Can., 74(10:T342-T349, Oct. 1973. 29 refs. (Presented at the Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, 7th, Vancouver, British Columbia, Sept. 18-20, 1972.)*

Bench-scale stripping experiments involving the stripping of hydrogen sulfide and methyl mercaptan from aqueous solutions were conducted to determine the lack of sulfur balances observed at kraft mill air stripping units during earlier tests. A reasonably good mass balance was obtained for the stripping of H2S and CH3SH from foul water with nitrogen. The lack of material balance obtained in earlier mill-scale tests appeared to be the result of problems associated with the analysis of the aqueous streams, particularly the inlet foul condensate. No evidence was obtained for reactions involving H2S or CH3SH in the stripping tower during stripping with N2. Correlations between stripping efficiency and flow rate ratio or stripping efficiency and pH of the foul water were observed. The efficient stripping of H2S and CH3SH required that the flow rate ratio be maintained below 130 and 40 mole/mole, respectively, and the pH below 6 and 8, respectively. The overall mass transfer coefficient and the heights of the overall transfer units were 0.0045 and 0.0032 mole/min-cu cm and 19.3 and 27.3 cm for H2S and CH3SH, respectively. (Author conclusions modified)

56754 **APTIC NO. 76855**

Stichting CONCAWE, The Hague (Netherlands), Ad-hoc Group on Aromatic Contents of Gasolines

EFFECT OF GASOLINE AROMATICS CONTENT ON EXHAUST EMISSIONS. *Rept. 3/73, 36p., July 1973. 44 refs.*

The effect of increasing gasoline aromatic content, as necessitated by lead content decreases on exhaust emissions is discussed. Exhaust emissions of carbon monoxide, hydrocarbons, and nitrogen oxides are affected to a minor extent, with both increases and decreases being involved. Fuel aromatic content is not expected to exert a major effect on particulate emissions based on very limited information. Little or no effect on photochemical reactivity of the exhaust and hence on photochemical smog is expected to result from increasing the aromatic content of gasoline. Vehicle polynuclear aromatic emissions are expected to increase somewhat, although vehicles are only a minor source of PNA emissions. (Author summary modified)

1972

56755 **APTIC NO. 81057**

Friedrich, F. D., G. K. Lee, and E. R. Mitchell

COMBUSTION AND FOULING CHARACTERISTICS OF TWO CANADIAN LIGNITES. *J. Eng. Power, vol. 1972:127-132, April 1972. 5 refs. (Presented at the Winter Meeting of the American Society of Mechanical Engineers, Annual, Washington, D. C., Nov. 28-Dec. 2, 1971, Paper 71-WA/CD-3.)*

Bienfait lignite from Saskatchewan and Onakawana lignite from James Bay are described. Although of the same rank, these two lignites differed substantially in physical structure. They were burned in a pilot scale, pulverized fired boiler primarily to study combustion performance and fireside fouling tendencies under slagtap conditions. Flame stability and complete combustion were readily obtained, although satisfactory slag tapping was not achieved with either fuel. Fireside ash deposit samples representing each fuel were collected from various parts of the boiler, and analyzed. Fly ash samples were analyzed. When burning Bienfait lignite, selective deposition of ash constituents took place, resulting in a eutectic composition downstream of the furnace exit. Selective ash deposition did not occur with Onakawana lignite. Combustion of Onakawana lignite under slagging conditions produced firable deposits that were easily removed by routine soot blowing. Generally, deposit buildup was not excessive and deposit composition, except sulfur, did not change appreciably with location in the boiler. Combustion of Bienfait lignite under slagging conditions produced strongly bonded deposits rich in water soluble alkali sulfates in the high temperature region of the boiler. These deposits were difficult to remove by soot blowing. The eutectic composition apparently resulted from depletion of calcium and magnesium and enrichment of silicon, iron, and sulfur. Injection of magnesium oxide or dolomite ahead of the screen tubes may control deposit structure sufficiently to permit removal by soot blowing. Fusion temperatures are given for both. (Author abstract modified)

56756 **APTIC NO. 81325**

Gadyak, V. A.

CHOOSING THE CROSS-SECTION FOR DETERMINING THE TEMPERATURE AND COMPOSITION OF FLUE GASES. *Thermal Eng (English translation from Russian of: Teploenergetika), vol. 19:32-35, Oct. 1972. 4 refs.*

The introduction in Soviet power engineering of high capacity boilers equipped with regenerative rotary air heaters (RRA) has increased demands for the accurate determination of the technical and economic characteristics of their operation. Clear instructions exist concerning the choice of the balance cross-section for boilers with tubular air heaters. The error in determining the efficiency of a boiler depends mainly on the error in determining the loss of heat with the exit gases. The temperature distributions and the distributions of the chemical composition of the flue gases at the RRA outlets of boilers burning natural gas and anthracite fines are analyzed. Air leakages in the circumferential, central seals of the rotor, under the radial metal sheets, and in the casing and the ends of the heater are the main reason for nonuniformity in distribution of the chemical composition of the flue gases and for the simultaneous disturbance to uniformity of the temperature. The nonuniformity of the distributions of the exit gases, having already originated in the RRA itself, cannot be eliminated in the gas ducts after the RRA under conditions of existing plants and the velocities in them. The installation of sensors to measure and record the temperature of the exit gases directly beneath the covers of the RRA or in the ducts downstream of it causes significant errors in the determination of the actual temperature. Equations are derived for heat loses in two sections of the system. The magnitude of the heat losses with the exit gases depends on the extent of the cold air leaks in the gas dusts after the final heating stage of the boiler. To increase the accuracy of calculation of the heat loses with the exit gases and, consequently, of the efficiency of the boiler unit, the balance point must be chosen after the fans.

1971

56757 **APTIC NO. 75399**

Mortier, A.

AUVERGNE BASIN COAL MINES: LA TAUPE POWER PLANT REPORT ON ACCEPTANCE TESTS. *(Houilleres du bassin d auvergne: centrale de la taupe compte-rendu des essais de reception). Preprint, Babcock-Atlantique, Paris (France), Testing and Shipping Div., Nov. 26, 1971. Translated from French, 16p.*

Data from boiler acceptance tests at the La Taupe coal fired power plant are presented. Carbon dioxide, oxygen, and carbon monoxide levels at the economizer outlet were 9.72-13.94%, 3.74-9.58%, and 0.007-0.10%, respectively. Unburned solids in the stack gas ranged from 4.79-20.53% and were unacceptably high. The efficiency of the boiler unit was estimated to range from 69.97-86.55%. The efficiency at minimum load was abnormally low due to excessive amounts of siftings. The particular boiler tested was converted for heating by an Ignifluid furnace.

CONTROL METHODS

1976

56758 **APTIC NO. 81198**

Becker, Hans

EXPERIENCES WITH THE ROTOVENT-WET DUST COLLECTION SYSTEM. *(Erfahrungen mit dem Rotovent-Nassentstaubungssystem). Text in German. Staub, Reinhaltung Luft, 36(1):26-32, 1976. 5 refs.*

The Rotovent wet dust extraction system uses a compressed air blower and a droplet separator to meet mining-specific needs for dust control. The system provides maximum efficiency with minimum dimensions, a flameproof design, and the optimum use of water. Test in mines and at the Dust Extractor Testing Station at Steinkohlenberghauverein were conducted to determine the effectiveness of the design modifications used in this system.

56759 **APTIC NO. 81424**

Chang, Kun and Win L. Chiou

FLUOROCARBON AEROSOL PROPELLANTS IX: ADSORPTION ON ACTIVATED CHARCOAL. *J. Pharm. Sci., 65(1):56-60, Jan. 1976. 23 refs.*

The adsorption of trichlorofluoromethane, dichlorodifluoromethane, and dichlorotetrafluoroethane on activated charcoal was studied at a temperature of 25 C. The adsorption versus pressure plots were consistent with the Brunauer, Emmett, and Teller (BET) type II and type IV isotherms. The adsorption mechanism appeared to proceed via condensation of the gaseous fluorocarbon molecules in the pores of the activated charcoal. The monolayer capacity derived from the BET equation was used to estimate the volume of micropores present in the activated charcoal; below the relative pressure of 0.01, the adsorption deviated from the BET plot. The adsorption capacity and adsorption potential at these lower pressures were greater than the extrapolated values. This deviation in favor of adsorption is an advantage in using this adsorbent as a filtering medium to remove aerosol propellants from air.

56760 **APTIC NO. 81299**

Kaldor, Tibor G. and Colin R. Phillips

AEROSOL SCRUBBING BY FOAM. *Ind. Eng. Chem. Process Design. Develop., 15(1):199-206, Jan. 1976. 12 refs.*

Extraction of particles from an air stream by foam was evaluated by varying throughput rate, residence time, and particle concentration. The concentrations and size distributions of both the input fly ash and the particles extracted into the foamate were measured and an efficiency of extraction was calculated. Qualitiative comparison of results with the mechanisms postulated was good. Sedimentation was fully effective on particles greater than 2 micron and diffusive deposition accounted for about 30% extraction in the 0.5 to 1.0 micron range. At the cross over (1-2 micron) from the sedimentation mechanism (course particles) to the diffusive mechanism (fine particles), removal was 5%. Aggregation in the foamate was the cause of the apparent low extraction of small (0.3-0.5 micron) particles and the high extraction of large ones. Extraction increased with residence time (1-3 min) and decreased with gas rate. (Author abstract modified)

56761 **APTIC NO. 81195**

Masuda, Senichi, Ioshiaki Doi, Michio Aoyama, and Akira Shibuya

BIAS-CONTROLLED PULSE CHARGING SYSTEM FOR ELECTROSTATIC PRECIPITATOR. *Staub, Reinhaltung Luft, 36(1):19-26, Jan. 1976. 10 refs.*

A bias-controlled pulse charging system was developed for solving back discharge by a purely electrical approach. It includes the expansion of an iron cloud. The system is used in the charging part of a two-stage precipitator equipped with an electrostatic collecting screen. It raised collection efficiency from 63% at the voltage operation to 92% for cement cooler dust. The use of bias voltage not only provides more freedom to the electrode design, but permits the use of ac or half-wave ac voltages instead of expensive pulsed waves.

56762 **APTIC NO. 81394**

Matsumura, Tsuyoshi

MAINTENANCE OF THE DUST COLLECTOR. IN CASE OF NIPPON STEEL CORP. *(Shujinsochi no meintenansu. Shinnippon seitetsu no keisu). Text in Japanese. Puranto Enginia (Plant Eng.), 8(1):55-60, Jan. 1976.*

The maintenance of the dust collecting equipment installed in a total steel manufacturing plant of Nippon Steel Corp. is described. The plant has a blister steel production of 10,000,000 ton/year, a lot space of 7,400,000 cu m, and 7000 employees. Pollution prevention for the coal and iron ore stock yard, iron manufacturing process, steel manufacturing process, pressing process, product storage, energy supply the equipment and pollution control equipment are jointly managed by the Pollution Control Section, Operation Control Section and Equipment Control Section. The maintenance of the dust collecting equipment at the sintering plant by the Equipment Control Section is chosen as an example in describing the maintenance system. The following related subjects are discussed: a summary of the sintering plant operation, maintenance control offices and officers, maintenance flow sheets, maintenance work, maintenance programs, maintenance material control, and estimation of maintenance effectiveness.

56763 **APTIC NO. 81429**

Otto, K. and C. N. Nontreuil

INFLUENCE OF TETRAETHYLLEAD AND LEAD SCAVENGERS ON OXIDATION OF CARBON MONOXIDE AND HYDROCARBONS OVER PT AND PD. *Environ. Sci. Technol., 10(2):154-158, Feb. 1976. 14 refs.*

The separate and combined effects of tetraethyl lead and the lead scavengers ethylene dibromide and ethylene dichloride on platinum and palladium catalysts designed for the oxidation of carbon monoxide and hydrocarbons in automobile exhaust were investigated. Automobile exhaust was simulated by the controlled combustion of isooctane. Ethylene dibromide was the only scavenger that decreased catalyst activity. Deactivation was especially severe for catalysts containing Pd. Pure isooctane restored activity completely. Scavengers alone did not enhance shrinkage of the noble metal surface. Tetraethyl lead caused permanent deactivation of the catalyst and irreversible loss of the Pt-Pd surface area. Total lead deposit, residual noble metal surface, and catalyst activity were not simple functions of the lead deposit but, rather, depended on the combination of the additives. (Author abstract modified)

56764 **APTIC NO. 81298**

Uchida, S., C. Y. Wen, and W. J. McMichael

THE ROLE OF HOLDING TANK IN LIME AND LIMESTONE SLURRY SULFUR DIOXIDE SCRUBBING. *Ind. Eng. Chem. Process Design Develop., 15(1):88-95, Jan. 1976. 27 refs.*

The role of complete mixing holding tanks in sulfur dioxide scrubbing processes by lime and limestone slurries was investigated. Data obtained from various sizes of holding tanks under different operating conditions were analyzed and mathematical models for the holding tanks in lime and limestone slurry processes proposed. The dissolution of lime into weak acid solutions is explained by a shrinking core model. The performance of the holding tanks in the limestone slurry process can be approximated by an equilibrium stage model in which the tank is assumed to be in dynamic equilibrium with the surroundings. These models are combined with venturi scrubbers to simulate venturi holding tank systems with a closed loop recycling of the liquor. The sensitivities of some operating variables such as the recycling liquor rate and the alkali make up rate on the absorption efficiency were examined. (Author abstract modified)

1975

56765 **APTIC NO. 81643**

Addoms, John F., David L. Kors, and Billy R. Lawver

EXHAUST EMISSIONS CONTROL DEVICE. *(Aerojet-General Corp., El Monte, Calif.) U. S. Pat. 3,906,725. 10p., Sept. 23, 1975. 9 refs. (Appl. July 2, 1973, 9 claims).*

An exhaust emissions control device is described which admits air in a controlled manner to the exhaust gases of an internal combustion engine. The device utilizes the concept of platelets or stacked plates constructed to provide a plurality of fine fluid flow paths along which air or oxygen can flow toward and into an exhaust gas stream. The flow is effectively controlled to yield optimum oxidizing effects by selectively designing the plates to form specific configurations for the flow paths. Reductions of 90% or greater in both the carbon monoxide and urburned hydrocarbons can be achieved with the device. The device can be used with a catalytic converter and with a thermal reactor equally well. This device is superior to other devices because it operates to mix air or oxygen with exhaust gases on a very fine scale by internally manifolding and injecting the air over the entire exhaust gas flow field. The compact nature of the platelet construction permits it to be located in the most strategic region without significant impact on other normal engine functions.

56766 **APTIC NO. 81640**

Akimoto, Ken

METHOD FOR DIRECTLY PREPARING A SULFATE OR SULFATES FROM EXHAUST GASES CONTAINING SO_2 GAS. *(Assignee not given.) U. S. Pat. 3,904,742. 8p., Sept. 9, 1975. 11 refs. (Appl. March 8, 1973, 3 claims).*

A method of preparing at least one sulfate directly from an exhaust gas emitted from a steam power plant or other industrial plant is described. The method uses a collecting solution such as a mangnesium compound, a calcium compound, a mg and ca containing compound or a mixture thereof, and a small amount of manganese (II) salt. Other methods for obtaining calcium sulfate from a precipitate produced by the lime process have the disadvantage of the addition of sulfuric acid which causes regeneration of sulfur dioxide. (Author abstract modified)

56767 **APTIC NO. 81651**

Alliger, Howard

GAS CLEANER. *(Assignee not given.) U. S. Pat. 3,905,788. 4p., Sept. 16, 1975. 8 refs. (Appl. March 6, 1974, 4 claims).*

The design of a fiber glass gas cleaner resistant to corrosion, abrasion, and clogging is described. Other filters quickly become clogged and filled because of the impurities in the material being filtered and because of the particular construction and materials used. This filter consists of screens arranged angularly with respect to each other and heated while compressed together under certain conditions of temperature and pressure so that the screens are less than 40% of the original thickness. The openings in the mesh are not substantially reduced in size from the original mesh size. The fiberglass becomes prestressed because it is locked in position. (Author abstract modified)

56768 **APTIC NO. 81418**

Ambrose, E. R.

HEAT RECLAIMING SYSTEMS. *Heating Piping Air Conditioning, 47(13):55-58, Dec. 1975. 4 refs.*

Air-to-air heat reclaiming systems are discussed. Air-to-air heat recovery exchangers are practical for many commercial and industrial applications where considerable quantities of supply and exhaust ventilation air are required. Several designs are now on the market: rotary cylindrical drum or wheel, heat pipes, runaround coils, and parallel plate heat exchangers. The chief attraction of these systems is adaptability to both existing and new installations. Heat from industrial processes can be recovered and used for space heating and/or domestic water heating. Instead of combustion products, high temperature exhaust gases circulate through the fire side of the heat exchanger. Air to air recovery devices can transfer heat from process to space heating systems. Heat pumps can recover process heat from space heating and/or domestic water heating.

56769 **APTIC NO. 78206**

Aoi, Tsuyoshi

EXHAUST GAS PURIFIER OF INTERNAL COMBUSTION ENGINE. *(Nainenkikan tono haien seijo* *sochi). Text in Japanese. (Assignee not given.) Japan. Model Util. Sho 50-28265. 2p., Aug. 21, 1975. 1 ref. (Appl. Dec. 29, 1970, claims not given).*

An exhaust gas purifier for internal combustion engines is described. The cleaning cylinder contains several discs with small holes which divide the cylinder into several chambers. The chambers are connected by a tube and the tube diameter of each chamber was larger for the chamber on the engine side than on the tailpipe side. These connecting tubes have several small holes and an exhaust gas cleaning agent is held on the outer side of the connecting tube in the chamber. The exhaust gas flows through the connecting tubes, and some of the exhaust gas flows into the chambers with the cleaning agent. The connecting tube of the last chamber is covered with a solid disc. Therefore, the exhaust gas flowing through the connecting tubes must go through the exhaust gas cleaning agent at least once before being emitted. By employing several independent chambers to hold an exhaust gas cleaning agent, the cleaning agent can be deteriorated evenly in all chambers.

56770 **APTIC NO. 81115**

Axelrod, Howard J.

UTILIZATION OF SOLID WASTE IN NEW YORK: A STATE GOVERNMENT S POSITIVE ACTION PROGRAM. *New York State, Albany, Dept. of Public Services, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 477-481. 1 ref. (Nov. 3-5.)*

Policies and incentives in New York state to utilize solid waste as a boiler fuel are described. Two state agencies are working together to develop a program whereby municipalities would have an incentive to prepare solid wastes instead of direct land or water disposal, and the privately owned electric utilities would be assured an equitable return on their investment in such a risk venture. Stricter Federal air and water quality regulations limit the use of existing incinerators, while land for disposal purposes is becoming critically scarce. The reclaiming of solid waste is approaching an economic break-even point with direct land disposal. The reclamation of various raw materials from solid waste potentially offers enough revenue income to offset additional capital investments.

56771 **APTIC NO. 81040**

Barber, J. C.

POLLUTION CONTROL IN FERTILIZER MANUFACTURE. *J. Environ. Quality, 4(1):1-11, Jan.-March 1975. 19 refs. (Presented at the American Society of Agronomy, Annual Meeting, 65th, Las Vegas, Nev., Nov. 15, 1973.)*

Regulations and standards for air pollution and industrial hygiene affecting fertilizer production are discussed. Technology available for the abatement of air and water pollution and for control of dust in the working environment is described. Technology has not yet been developed to cope with the particulate emission problems at ammonium nitrate and urea prilling towers. Both air and water pollution problems at new nitrogen fertilizer production facilities can be lessened by the selection of low energy scrubbers. Plant tests are currently being made with a low pressure drop impingement type of scrubber. One possible solution for new plants is to granulate ammonium nitrate and urea in equipment which is amenable to particulate emission abatement. Dust scrubber effluents and plant washdown obtained at granular fertilizer plants can be converted into liquid fertilizers; however, the dust collection system should be designed to avoid excessive dust pickup. Much progress has been made toward recovery of by-product fluorine, but by-product gypsum recovery involves large capital investment and extensive market development. Water pollution is also discussed. (Author abstract modified)

56772 **APTIC NO. 81363**

Barker, George E.

LAYERED RHODIUM AND NICKEL CATALYST FOR NOX REDUCTION. *(Monsanto Co., St. Louis, Mo.) U. S. Pat. 3,914,376. 11p., Oct. 21, 1975. 3 refs. (Appl. Feb. 8, 1973, 11 claims).*

A dual functional catalyst formed by depositing a nickel component on an inert support, followed by an alumina coating and a rhodium component is described. The use of the catalyst to remove nitrogen oxides from automobile exhaust, with advantages especially evident in usage over a varying temperature range, and with use of rich carburetion in conjunction with addition of supplemental air to lessen ammonia formation is also described. A catalyst with this structure is more resistant to physical degradation upon aging than are similar catalysts in which the nickel is deposited on an activated alumina coating. (Author abstract modified)

56773 **APTIC NO. 81065**

Bauer, Hans and Alois Scharsach

TODAYS REFUSE FIRED BOILERS. *Von Roll Ltd., Zurich (Switzerland), Environmental Engineering Div., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 485-463. (Nov. 3-5.)*

The design and operation of an integrated radiation boiler are discussed. Using conventional furnace boiler design for solid fuel as a model, the refuse furnace is integrated in the boiler. The combustion chamber receives waterwalls above the grate, forming the radiation part and first pass of the boiler. Improvements were made by the introduction of secondary air and more practical design of the combustion chamber, by coating the radiation surfaces of the boiler above the grate with castable refractory lining, and by enlarging the crosspitch of the convection bundles.

56774 **APTIC NO. 81148**

Bauer, Hans-Dieter and Erich Bruckmann

RESULTS OF COMPARATIVE MEASUREMENTS BETWEEN VARIOUS DUST ANALYZERS AND EVALUATION OF THEIR SUITABILITY IN PRACTICAL OPERATION. *(Ergebnisse von Vergleichsmessungen zwischen verschiedenen Staubmessgeraeten und Beurteiling ihrer Eignung fuer die betriebliche Praxis). Text in German. Staub, Reinhaltung Luft, 35(12):465-470, Dec. 1975. 15 refs.*

In West Germany, all equipment for removal of fine dusts in industrial workplaces must meet the standards of the MAC-list. Comparison was made between the Simpeds 70 MK2 and the TBF 50, which have separation lines different from those approved by the Johannesburg Convention for the MPG II for routine measurements in the hard coal industry. The Simpeds 70 MK 2 measurements showed a dependence upon the dust concentration and velocity in the blower stream. For the TBF 50, however, showed greater responsiveness to alterations of the particle size structure.

56775 **APTIC NO. 81644**

Beaty, William Ralph, Jr.

CATALYTIC HYDROCARBON CONVERSION PROCESS. *(Continental Oil Co., Ponca City, Okla.) U. S. Pat. 3,900,430. 10p., Aug. 19, 1975. 10 refs. (Appl. May 14, 1973, 7 claims).*

A process and catalyst for converting hydrocarbon oils to desirable components were described. The oils are converted in the presence of hydrogen under hydrocarbon conversion conditions with a catalyst consisting of a catalytic amount of a catalytic metal support on gamma alumina. Prior to this application, alumina has been too heavy (approximately 45 lb/cu ft) for extensive use as a catalyst. The method can be used for hydrodesulfurization or dehydrogenating hydrocarbon oils. (Author abstract modified)

56776 **APTIC NO. 81491**

Berger, Jerry F.

DESULFURIZATION OF GASOLINE. *Environ. Health Perspect., vol. 10:131-142, April 1975. 12 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

Although gasoline blending streams exhibit widely varying sulfur concentrations, significant quantities of low-sulfur motor gasoline cannot be manufactured by reallocation of existing components without substantial sacrifices in the useful properties of the remaining fuels having normal sulfur levels. Additional desulfurization capacity may be required in 1978. To meet the anticipated demand for low-sulfur unleaded gasoline which may be required for catalyst-equipped automobiles it will be necessary to install process equipment based on known hydrotreating technology. The effects which this construction program would exert on the activities, abilities, and needs of one petroleum refiner are sketched for 100 ppm or 50 ppm sulfur. The impacts of installing the process facilities which would be necessary are discussed in terms of time requirements, capital needs, and added energy expenditures. Additional hydrotreating along with related required processing imposes an additional energy need; gasoline pool volume will shrink somewhat if crude intake is unaltered. (Author abstract modified)

56777 **APTIC NO. 81617**

Boersma, M. A. M.

CATALYTIC AFTERTREATMENT OF EXHAUST GASES. PART 5. *(Katalytische nabehandeling van uitlaatgassen 5). Text in Dutch. Polytech. Tijdschr., Ed Procestechniek (The Hague), 30(16):529-534, Aug. 1975. 8 refs.*

The design of catalyst carriers and the degradation and deactivation of catalyst in exhaust cleaning devices are discussed. Monolithic honeycomb carriers are usually superior to other monolithic designs due to their reduced flow resistance. Delta-alumina and alpha-alumina are used most widely as monolith materials because of their high specific surface. The catalyst quantity usually ranges between 0.1 and 1% relative to the carrier. The deactivation of catalytic exhaust cleaning devices may be due to a reduction of the active surface, changes in the porous structure, or the irreversible loss of active catalyst as a result of abrasion, volatilization, and chemical reactions between the carrier material and the catalyst. The pore size for nitric oxide- reducing catalysts should be preferably between 200 and 1000 A. Catalysts are poisoned by lead, phosphorus, and sulfur compounds that are present in gasoline as additives.

56778 **APTIC NO. 81660**

Brooks, Walter G. and John P. Knodle

SYSTEM FOR SUPPLYING INERT GAS. *(Production Operators, Inc., Houston, Tex.) U. S. Pat. 3,905,773. 4p., Sept. 16, 1975. 12 refs. (Appl. Dec. 26, 1972, 5 claims).*

The efficacy of a catalytic converter that renders exhaust free of corrosive acid-forming components depends on the presence in the exhaust of optimum quantities of reducing agents, such as carbon monoxide and free hydrogen. A system for rendering the exhaust gases from an internal combustion engine continuously at the optimum composition for conversion, even where multiple carburetors are used, is described. An exhaust gas analyzer is used to control the BTU value of the fuel supply to the engine, by adding to the intake fuel controlled proportions of a gas having substantially different BTU than the main fuel gas. Either higher or lower BTU additive gas may be used with a corresponding adjustment of the carburetor or fuel mixing valves. (Author summary modified)

56779 **APTIC NO. 81663**

Brown, William R.

EXHAUST GAS TREATING DEVICE AND AIR CHARGER. *(Assignee not given.) U. S. Pat. 3,902,854. 4p., Sept. 2, 1975. 7 refs. (Appl. June 11, 1974, 13 claims).*

An electrical igniting device for treating exhaust gases from industrial installations is described. Other anti-pollution devices generally suffer from rapid deterioration and require frequent replacement or repair. This device is readily installed or replaced in different types of installations requiring anti-pollution treatment of exhaust gases. The device requires less frequent replacement because it contains a protective housing. Exhaust gas is discharged from a building through an outlet conduit into a vertical chimney stack which rises above a concrete base. The hydrocarbons are reduced by an electrical igniting device mounted on the tubular chimney stack adjacent to the location at which the inflow into the vertical chimney stack occurs from the outlet conduit. The exhaust gas is treated by a liquid such as water injected into the exhaust gas flow stream by means of a pump drawing the liquid from a reservoir tank. The outlet of the pump is connected to a liquid supply conduit for introducing the liquid into the gas flow stream.

56780 **APTIC NO. 81101**

Buhlitz, D.

REMOTE HEATING AND COMBINED POWER/HEAT GENERATION IN THE AREA OF BERLIN. *(Fernheizung und Kraftwaermekopplung im Berliner Raum). Text in German. VDI (Ver. Deut. Ingr.) Ber., (236):207-212, 1975. 5 refs.*

Two residential areas in West Berlin have remote heating from thermal power plants generating both electricity and steam for this purpose. One power plant is powered with coal and extra-light fuel oil, while another uses coal and natural gas during the summer period. The combination of electricity and heat generation makes it possible to save some 250,000 tons of coal annually, which entails a corresponding reduction in the air pollutant emissions. The possible fuel oil shortage makes it necessary to envisage the construction of nuclear power plants which could also be used for remote heating and electricity generation economically.

56781 **APTIC NO. 81441**

Bundesen, Lorenz, Johannes Brettschneider, and Heinrich Knapp

FUEL METERING DEVICE FOR INTERNAL COMBUSTION ENGINES. *(Robert Bosch G.m.b.H., Stuttgart (West Germany)) U. S. Pat. 3,900,014. 4p., Aug. 19, 1975. 8 refs. (Appl. July 25, 1973, 6 claims).*

A fuel metering device for an internal combustion engine is described that achieves integration of the output signals using a minimum number of electrically operating parts while avoiding intermittent output signals that exert adverse effects on engine operation and exhaust gas composition. The device includes a fuel reservoir from which a fuel line leads to an air intake suction tube of the engine. The amount of fuel metered into the air flowing through the suction tube is determined by the pressures in the fuel reservoir and suction tube as well as by the output signal of a measuring sensor which detects the composition of the engine exhaust gases. (Author abstract modified)

56782 **APTIC NO. 81648**

Burtis, Wilson A. and William C. Babcock

ANTI-POLLUTION SERVICE STATION ASSEMBLY. *(Assignee not given.) U. S. Pat. 3,907,010. 10p., Sept. 23, 1975. 2 refs. (Appl. Oct. 26, 1973, 14 claims).*

An anti-pollution service station assembly is described in which the escape of vaporized hydrocarbon products to the ambient atmosphere is minimized, both from the underground fuel storage reservoir that forms a part of the assembly and from fuel tanks of internal combustion engine powered vehicles during fueling. Vaporized hydrocarbon fuel that would normally escape to the ambient atmosphere from the fuel tank of the vehicle is collected and returned to the underground fuel reservoir. Hydrocarbon vapors that would normally vent to the ambient atmosphere from the underground fuel tank are adsorbed by cartridges of activated carbon or a like material, and these adsorbed vapors are subsequently recovered from the cartridge by subjecting the latter to heat, preferably in the form of steam. A delivery truck that supplies hydrocarbon fuel to the assembly is provided with a conduit that returns vaporized hydrocarbon fuel from an underground reservoir to the tank on the delivery vehicle as the underground reservoir is filled. (Author abstract modified)

56783

APTIC NO. 81442

Canale, Raymond P.

INTERNAL COMBUSTION ROTARY ENGINE WITH INTERNAL EXHAUST GAS RECIRCULATION. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,906,907. 5p., Sept. 23, 1975. 4 refs. (Appl. Sept. 3, 1974, 2 claims).*

A rotary internal combustion engine which includes internal exhaust gas recirculation for the reduction of nitrogen oxide emissions is described. A peripherally extending slot within the wall of the engine is located relative to the intake and exhaust porting to provide an exhaust gas connection past the apex seal on the rotor between leading and trailing chambers at the end of the trailing chamber s exhaust phase and at the end and beginning of the leading chamber s respective intake and compression phases. Thus, the fresh mixture in the trailing portion of the leading chamber is replaced with exhaust gas. (Author abstract modified)

56784

APTIC NO. 81484

Christensen, Robert I. and George D. Gould

HYDRODESULFURIZATION PROCESS FOR THEE PRODUCTION OF LOW SULFUR HYDROCARBON MIXTURE. *(Chevron Research Co., San Francisco, Calif.) U. S. Pat. 3,902,991. 13p., Sept. 2, 1975. 9 refs. (Appl. April 27, 1973, 17 claims).*

A unique hydrodesulfurization process for the production of low-sulfur hydrocarbon mixtures is described. Low-S hydrocarbon mixture and fuel oil blends below 0.2 or below 0.1 wt% S are obtained by hydrodesulfurizing vacuum gas oil under a hydrogen partial pressure of 300-800 psig, with a select high activity desulfurization catalyst. Further embodiments include the hydrodesulfurization of S containing vacuum residuum and mixing portions of the desulfurized hydrocarbon residuum with the vacuum gas oil feed or blending fuel oil from portions of the desulfurized vacuum gas oil and desulfurized vacuum residuum product. Further process steps include deasphalting of vacuum residuum or hydrodesulfurizing vacuum residuum with delayed coking of at least a portion of the product.

56785

APTIC NO. 81734

Christman, Robert D. and Geoffrey R. Wilson

HYDRODESULFURIZATION OF PETROLEUM DISTILLATES. *(Gulf Research and Development Co., Pittsburgh, Pa.) U. S. Pat 3,907,668. 6p., Sept. 23, 1975. 7 refs. (Appl. March 25, 1974, 4 claims).*

An improved catalyst for the hydrodesulfurization of petroleum distillates is described which is capable of continuously removing at least 80% of the sulfur from a feed containing up to 6 wt% sulfur. The catalyst contains a Group VI-B hydrogenating component, at least one iron group hydrogenating component, and alumina. Catalyst preparation is achieved by calcining alumina having a bayerite content of 0-50 wt% at a temperature of 800-1600 F, impregnating the calcined alumina with the hydrogenating components, and calcining the impregnated alumina at 800-1600 F. The composite catalyst is characterized by a pore volume of at least 0.5 cc/g, a surface area of at least 150 sq m/g, and average pore radius of 45-75 A. At least 65% of the pore volume of the catalyst consists of pores having a radius in the range of 50-300 A. (Author abstract modified)

56786

APTIC NO. 81346

Cleve, Urban

PROBLEMS OF ENERGY AND ENVIRONMENT. PLANNING OF PLANTS FOR DRYING AND PROCESSING ORGANIC RAW MATERIAL. *(Energie- und umwelttechnische Probleme. Planung von Anlagen zur Trocknung und verarbeitung organischer Rohstoffe). Text in German. Wasser Luft Betrieb, 19(11):637-643, 1975. 26 refs.*

Environmental problems and air and water pollution control in the drying and processing of organic raw materials are discussed with special regard to animal carcass processing plants. Malodorous emissions released by the processing plant contain hydrogen sulfide, mercaptans, fatty acids, cholesterols, and other substances with low odor threshold. Thermal incineration of these waste gases at temperatures above 850 C without waste heat utilization is unacceptable economically, and also environmentally due to the emission of sulfur dioxide, carbon monoxide, nitrogen oxides, and soot. While adsorption on activated carbon is possible, desorption and destruction is problematic. Therefore, the concentrated process gases, and especially the large volumes of ventilation air from adjacent locals must be deodorized by multi-step scrubbing, using a first step with degassed and softened water, a second step with alkaline solution for the absorption of acid components, a third step with acid solution to retain basic components, and a final scrubbing step. Sodium hydroxide, alkaline hypochloride solution, sodium hypochloride, sulfuric acid, ozone, and chlorine dioxide are used for absorption and sterilization in the different steps.

56787

APTIC NO. 81401

Cohn, J. G.

CATALYTIC CONVERTERS FOR EXHAUST EMISSION CONTROL OF COMMERCIAL EQUIPMENT POWERED BY INTERNAL COMBUSTION ENGINES. *Environ. Health Perspect., vol. 10:159-164, April 1975. 27 refs.*

The development of PTX, monolithic catalytic exhaust purifiers, is outlined, and their first use for exhaust emissions control of commercial equipment is described. The main use of PTX converters is on forklift trucks. The purification achievable with PTX-equipped fork-lift trucks under various operational conditions is discussed. An estimate of the total operational time during the last 10 yr of use of commercial PTX purifiers is about 1.2 times 10 to the 8th power hr. Some converters have exceeded 10,000 hr of operational life. No adverse health effects have been reported, and PTX-equipped internal combustion engines appear safe for use in confined areas. (Author abstract modified)

56788

APTIC NO. 81593

Constantinescu, Petre, Emil Oachis, Dorin Trimbitas, and Doina Alexandrescu

AIR TREATMENT APPARATUS. *(Intreprinderea Metalul Rosu Cluj, Clug (Romania)) U. S. Pat. 3,900,301. 8p., Aug. 19, 1975. 6 refs. (Appl. July 16, 1974, 10 claims).*

An air treatment apparatus is described in which air can be cooled and humidified, heated and humidified, heated, fresh or recycled, with or without filtering. Other air treatment devices are limited in that they can either heat or cool but usually not with the same unit. This apparatus consists of a blending chamber having a rectangular prismatic shape which is provided with rectangular ducts on either side for delivering air, which is further treated in the ducts, to the surrounding surface. There is a pair of oppositely effective axial flow fans in the blending chamber. The apparatus can be mounted within as well as outside a structure.

56789 **APTIC NO. 81654**

Crowle, William G. and Efrem M. Ostrowsky

AIR FRESHENER CONTAINER OR VAPOR DIFFUSING DEVICE. *(VCA Corp., Baton Rouge, La.) U. S. Pat. 3,908,906. 6p., Sept. 30, 1975. 5 refs. (Appl. July 5, 1974, 12 claims).*

An air freshner container or vapor diffusing device is described for masking odors. It consists of a base which contains an air freshener deodorizer and a cover which can be manually moved to control the rate of volatilization or evaporation of the freshener.

56790 **APTIC NO. 81136**

Davis, Joan S.

ENERGY LIMITS TO TECHNICAL RECYCLING. *Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 41-47. 3 refs. (Nov. 3-5.)*

The energy limits in the technical recycling of metals are discussed. The increasing dissipative use of lead, cadmium, arsenic, silver, mercury, and copper leads to rapidly diminishing reserves as well as to air pollution. Recycling of these metals ameliorates the severity of both of these problems. The degree of dispersion of the metals prevents their recovery. The use of Pb in gasoline and paints causes a disturbingly high concentration of Pb in air. The energy requirement for recovering Pb at these concentrations of several hundred ppm is formidable, particularly in the recovery from air. Thhe primary production of Al is extremely energy intensive, mainly as electrical energy. Recycling Al requires only about 7% of this energy. This relationship provides a very favorable basis for energy recovery.

56791 **APTIC NO. 81409**

Davis, Thomas A.

DISPOSAL OF WASTE DUST FROM CEMENT KILNS. *IEEE (Inst. Elec. Electron. Engrs.) Trans. Ind. Appl., IA-11(6):669-673, Nov./Dec. 1975. 16 refs. (Presented at the IEEE (Inst. of Electrical and Electronic Engineers) Cement Industry Technical Conference, Mexico City, Mex., May 13-16, 1974, Paper TOD-74-109.)*

In the manufacture of portland cement there is considerable generation of dust. Seventy-two of 101 plants surveyed reported collection efficiencies of 99% or greater. Cyclones are inefficient in collecting dust particles less than 10 micron in diameter, which is the maximum diameter of nearly half of the dust. Mechanical collectors have collection efficiencies of about 70%, while baghouses or electrostatic precipitators approach 100%. Over one fourth of the dust collected from kiln exhaust gases is discarded because of excessive concentrations of alkalies, predominantly potassium, which makes the dust unsuitable for return to the cement making process. Leaching of alkalies from kiln dust, either in rainwater percolating through disposal piles, or in dust reclamation processes, causes the most serious water pollution problem faced by the cement industry. Treatment of the leachate by electrodialysis to recover and concentrate alkalies is recommended. A promising alternative to disposal of the dust is utilization in agriculture for neutralizing acidic soils and replenishing potassium removed by crops. (Author abstract modified)

56792 **APTIC NO. 81274**

Dewell, P.

BASIC CONSIDERATIONS OF DUST AND FUME CONTROL ENGINEERING FOR MOULDING SAND PLANT AND DRESSING OPERATIONS IN IRON FOUNDRIES. *Brit. Foundryman, 68(10):264-272, Oct. 1975. 3 refs.*

Basic considerations of dust and fume control engineering for moulding sand plant and dressing operations in iron foundries are discussed. The potential health hazard associated with iron foundry dust is pneumoconiosis. This hazard arises from fine dust particles which are inhaled and remain airborne long enough to reach the terminal air sacs of the lung and enter the lung tissue. The threshold limit values (TLV) for iron foundry dust are expressed in terms of the respirable fraction of airborne dust by the formula: TLV (in mg/cu m) equals 10/% respirable quartz + 2. Significant sources of dust and fume include: the sand mill, fume from mould pouring and cooling, shake out, chute and hopper discharge, underground pits, rotary screen, and sand storage hoppers. Practical methods available for controlling the airborne dust so that the TLV is not exceeded are discussed.

56793 **APTIC NO. 81463**

Dow, Irving, A., Jr. and Carl A. Gersitz

APPARATUS TO IMPROVE COMBUSTION OF FUEL. *(Irving A Dow, Jr., Elizabeth, N. J.) U. S. Pat. 3,907,210. 7p., Sept. 23, 1975. 6 refs. (Appl. April 4, 1974, 10 claims).*

Preheated secondary combustion air is delivered across the axis of the burner flame in an oil-fired boiler. By virtue of a secondary combustion air delivery apparatus, the secondary air is heated in three stages before delivery into the flame and is then delivered in a multiplicity of evenly pressurized air jets to control the size of the flame while increasing the heat. A substantial savings of fuel is obtained and boiler efficiency is increased. A correspondingly greater reduction in soot deposited on the surrounding walls of the furnace chamber is achieved, as well as an increased reduction in pollutants reaching the atmosphere. (Author abstract modified)

56794 **APTIC NO. 81147**

Dreifke, Gerald E., John F. McLaughlin, and Jerrel D. Smith

HISTORY OF SO2 REMOVAL SYSTEM AT THE MERAMEC PLANT OF UNION ELECTRIC. *Environ. Letters, 9(4):395-403, 1975. 6 refs.*

A limestone injection wet scrubber sulfur dioxide removal system was experimentally installed on an intermediate size coal fired utility boiler at Meramec Power Plant in September, 1968. Difficulties were encountered with plugging and scaling due to calcium sulfate, and the experiment was terminated in June, 1971. Similar experience elsewhere has led to the conclusion that limestone boiler injection systems are not practical for removal of SO2 from stack gas. The scrubber installation cost approximately $10/kilowatt of unit plant capacity. Brief statements about operating experiences with three wet scrubber installations are included. There are other potential environmental problems created through the operation of sulfur dioxide stack gas removal systems, including sludge generated by throw-away systems and additional energy needs to operate the systems. The Environmental Protection Agency document on background information for proposed new source performance standards states that the lime slurry scrubbing system has been adequately demonstrated on large steam generators. A supplemental statement refers to Environmental Protection Agency tests on the facility, but there is no knowledge of such a test having been conducted. The emission standards are criticized. The true cost of sulfur dioxide systems is still unknown. Installing sulfur dioxide scrubbers on three major coal fired plants would result in average power cost increase of about 25%. Other ways to control air quality exist. Corrections should be made in air quality control programs to provide acceptable air quality at the least social and economic cost to the general public. (Author abstract modified)

56795 **APTIC NO. 81490**

Dyer, Robert S.

HEATING SYSTEM WITH EXTERIOR AIR INLET FOR COMBUSTION CHAMBER. *(Assignee not given.) U. S.*

Pat. 3,906,925. 8p., Sept. 23, 1975. 4 refs. (Appl. March 7, 1974, 3 claims).

A heating system with an exterior air inlet for the combustion chamber of a furnace is described. In present furnaces air which is required for combustion is provided from the air within the building. As a result, air must flow from outside to inside the building to fill the void left by the air flowing into the combustion chamber and out through the flue. Air from the external atmosphere outside of the building is filled with particulate matter. This polluted air flows through the building. This system has an air inlet duct which leads from exterior of the building directly to the combustion chamber. The outside polluted air is not required to flow through the building, through the air inlet duct.

56796

Eggert, W. **APTIC NO. 81189**

CONTROL AND MONITORING OF AIR CONDITIONING SYSTEMS FOR THE CENTRAL DATA PROCESSING DEPARTMENT. *(Regelung und Ueberwachung von Klimaanlagen fuer die zentrale Datenverarbeitung). Text in German. Heizung Lueftung Haustech., 26(7):261-263, July 1975.*

Requirements on air quality, and the control and monitoring of air conditioning systems for central data processing units are described. Clean air, required for computer centers, is provided by two-step filtration, consisting of a main filter which should have an efficiency of about 90% for all particles larger than 5 microns, and of a second fine filter with 90% efficiency for all fractions above 1 micron. The first step is a mechanical filter and the second step consists of an electrostatic precipitator in most cases. Carbon monoxide, carbon dioxide, and sulfur dioxide are harmful for data processing equipment when they are present in concentrations over 110 mg/cu m, 9000 mg/cu m and 13 mg/cu m, respectively.

56797

Eisenburger, J. P. **APTIC NO. 81061**

TRANSFORMATION OF WASTE INTO ENERGY AND A MINERALIZED REUSABLE GRANULATE WITH A HIGH TEMPERATURE SYSTEM. *Environmental Control Lacoray S. A., Geneva (Switzerland), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 331-336. (Nov. 3-5.)*

A flame chamber process (FCP) for the transformation of waste into energy is discussed. The system treats wastes of high calorific value and operates with temperatures up to 1600 C. The flue gas is completely burned and causes considerably less corrosion than unburnt, laminated gas. The dust content of the flue gas is very low, between 50 and 300 mg/cu Nm at 7% carbon dioxide at the end of the afterburner chamber, due to the built in liquid filter of the system. The treatment has possible use in controlling auto combustion emissions.

56798

Elliott, D. E. **APTIC NO. 81107**

STEAM GENERATOR WITH FLUIDIZED BED FURNACES. *(Dampferzeuger mit Wirbelbett-Feuerungen). Text in German. VDI (Ver. Deut. Ingr.) Ber., vol. 236:97-108, 1975. 19 refs.*

Recent developments in coal-firing steam generators with fluidized-bed furnaces in Great Britain, and their environmental implications are described. The reduced combustion temperature in fluidized-bed furnaces is especially suitable for the reduction of the oxides of nitrogen emissions, and in particular for the sulfur dioxide emissions, since the combustion temperature comprises the temperature range in which crushed limestone is most efficient with respect to SO2 removal, namely 820-850 C. Dolomite is less sensitive to the temperature than limestone, and it is more favorable than the former due to its calcination to a porous, pervious structure. The spent limestone can be regenerated in a reducing atmosphere to obtain SO2 in a concentration of 6-10% which can be further processed to sulfur or sulfuric acid, carbon monoxide, and limestone to be recycled within the desulfurization process. Up to 80% of the SO2 can be removed from the flue gases by the addition of pulverized limestone with a particle size of less than 44 micron at a calcium-to-sulfur ratio of 2.6. Adsorption in a bed of alkalized alumina in a temperature range of 200-300 C is equally efficient. Steam generators with fluidized-bed furnaces are characterized in general by high performance, reduced costs, and reduced air pollutant emissions.

56799

Farkas, G. S. **APTIC NO. 81137**

REQUIREMENTS AND SOLUTIONS FOR THE CONVERSION OF MUNICIPAL REFUSE TO INDUSTRIAL STEAM. *Shawinigan Engineering Co., Ltd., Montreal (Quebec), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 464-469. 2 refs. (Nov. 3-5.)*

The conversion of municipal refuse to industrial steam is discussed. A plant is described in which steam is sold to a paper mill under a long term arrangement. Owing to the terms of the steam sale contract the plant had to be designed to perform the dual function of being both an environmentally satisfactory incinerator plant and a steam generating plant of acceptable industrial reliability. The plant consists of four incinerator units equipped with sloping, reciprocating grates for the mass burning of unprepared refuse. When disposing of 1000 ton municipal refuse/day the plant is capable of producing approximately 150 t/hr steam at 48 bar and 316 C. All available steam is sold to the paper mill, providing approximately half of its steam demand.

56800

Farnsworth, J. Frank, D. Michael Mitsak, and J. F. Kamody **APTIC NO. 81112**

CLEAN ENVIRONMENT WITH K-T PROCESS. *Energy Commun., 1(3):251-287, 1975.*

Gasification of solid or liquid fuels by the commercially proven Koppers Totzek process offers a pollution-free means of producing a 300 Btu/cu ft synthesis gas which can be readily substituted for natural gas in industrial fuel applications. It can be catalytically upgraded to a heating value of 960 Btu/cu ft to provide a gas comparable to and interchangeable with natural gas. The Koppers Totzek synthesis gas can also be converted to liquid hydrocarbons. The coal is dried and pulverized before gasification. Oxygen, steam, and coal react, gasifying the carbon and volatile matter of the coal and converting the coal ash into molten slag. The gas is cleaned and cooled in a venturi scrubbing system in which the entrained solids are reduced to 0.002 to 0.003 grain/standard cu ft. Particulate laden water from the gas cleaning and cooling system is clarified and recirculated. Chemical reaction processes or physical absorption processes can be used to remove sulfur compounds from the gas. Typical gasification data for western and eastern coals and petroleum coke feedstock are given. Advantages of the Koppers Totzek process include versatility, flexibility, simplicity of construction and ease of operation, low maintenance, high capacity, safety, and efficiency. The sulfur compounds removed can be converted to elemental sulfur suitable for sale to the chemical industry. The solid material removed is suitable for road aggregate, landfill, or for use in cinder blocks. Coal is stored and handled so as to minimize dust. Particulate matter in gases used to dry the coal is controlled by cyclones, bag filters, or precipitators. Only minimum treatment of the wastes from actual gasification, cooling and cleaning is required.

56801

Freitag, W. and A. Goldschmidt **APTIC NO. 81348**

HIGH SOLIDS LACQUER SYSTEMS - NON-POLLUTING AND ECONOMIC. *(Festkoerperreiche Lacksysteme (High Solid s)- umweltfreundlich und wirtschaftlich). Text in German. Metall (Berlin), 29(10):1068-1070, Oct. 1975.*

High solids lacquer systems and their environmental aspects are described. High solids lacquer systems, containing at least 80% solids, imply a reduction of solvent emissions during spraying and drying due to the reduced solvent content, and also an additional emission abatement as a result of reduced fresh air expenditure for the spray box and the reduced drying temperatures. Through the use of high solids lacquer systems, it is possible to reduce the air pollutant emissions to one third, and to save a considerable amount of energy as compared with conventional lacquers.

56802 **APTIC NO. 81342**

Friedrichs, D.

NOVEL FILTER SCREENS. *(Neuartige Filtertressen). Text in German. Aufbereitungs-Technik, 16(10):530-537, 1975.*

A novel filter screen with reduced warp thread thickness for the separation of particulate matter from gases is described. The effective filtering surface area is over 40%, i.e., considerably higher than in conventional woven filters. The new filter screen represents an optimal solution with respect to regeneration and storage capacity. In addition, highly exact weaving is possible. Its service cycle between two regenerations is substantially longer than that of conventional filters.

56803 **APTIC NO. 76656**

Fujimoto, Hajime, Naoshizu Fukui, Hideaki Tanabe, and Go Sato

STUDIES ON GASOLINE ENGINES EQUIPPED WITH A TWO-FLUID REFLUX TYPE SPIRAL INJECTION VALVE. *(Ni-ryutai kanryushiki uzumaki funshaben o mochiita gasoline kikan no kenkyu). Text in Japanese. Preprint, Japan Society of Autmotive Engineers, Tokyo, p. 81-90, 1975. 9 refs. (Presented at the Japan Society of Automotive Engineers Science Lecture Meeting, Tokyo, Japan, May 13-15, 1975.)*

A substitute for the evaporator in gasoline engines was developed. The spraying rate of the fuel was 6 cc/sec or less. The supply pressure of fuel was less than 1.0 atmosphere. The valve construction was almost the same as that at a conventional two fluid reflux type spiral injection valve. However, the spray width was minimized with the aid of the flow of the inhaled air. The angle of the inside air jet was 120 deg to minimize the widening of the spray. The shape of the injection valve was so designed that the resistance against the air flow was minimized. The pulverizing of fuel was much improved over that of a conventional evaporator. The critical dilute air-fuel ratio was also increased. Stable operation was possible up to an air-fuel ratio of 18-20. The effect of the time of ignition of the content of poisonous materials in the discharged gas was little. However, the effect of the fuel consumption ratio and the reduced axial torque was significant. Therefore, it is possible to clean the exhaust gas by delaying the ignition time without sacrificing fuel economy.

56804 **APTIC NO. 81488**

Garcea, Giampaolo

INTERNAL COMBUSTION ENGINE OF THE FUEL INJECTION TYPE HAVING MEANS FOR REDUCING THE EMISSION OF UNBURNED PRODUCTS WITH THE EXHAUST GASES. *(Alfa Romeo, S.p.A., Milan (Italy)) U. S. Pat. 3,906,909. 6p., Sept. 23, 1975. 12 refs. (Appl. Dec. 14, 1973, 3 claims).*

A method for reducing the emissions of unburned hydrocarbons in the exhaust gas of internal combustion engines of the fuel injection type is described. In this method both the fuel feed and the air feed are cut off when the engine is driven by the vehicle wheels. This eliminates the drawbacks encountered in fuel injection engines which are only provided with fuel feed cut off. A relevant reduction of unburned fractions in the exhaust gases is obtained.

56805 **APTIC NO. 81666**

Garcea, Giampaolo

EXHAUST SYSTEM FOR INTERNAL COMBUSTION ENGINES. *(Alfa Romeo, S.p.A., Milan (Italy)) U. S. Pat. 3,906,722. 8p., Sept. 23, 1975. 3 refs. (Appl. Feb. 5, 1974, 5 claims).*

A pollution prevention system for the exhaust of an internal combustion engine is described. A set of automatic valves allows atmospheric air to be admixed with the hot exhaust in the exhaust pipes. The valves are opened by negative pressures as they cyclically occur in the exhaust pipes and are closed by a resilient bias action. Post combustion of the exhaust gases due to the air admixture can be supplemented by catalytic action or thermal insulation to keep the exhaust hot. Other systems cause considerable power losses since they require the expenditure of a certain amount of power for driving the air pump and because they originate high exhaust back pressures. (Author abstract modified)

56806 **APTIC NO. 81158**

Gauthier, J. C. and J. C. Pillard

RESULTS OF EXPERIMENTS WITH A HIGH-EFFICIENCY BURNER FOR A 700 MW POWER PLANT. *(Versuchsergebnisse eines Brenners mit hohem Wirkungsgrad fuer ein Kraftwerk mit 700 MW). Text in German. VGB Kraftwerkstechnik, 55(7):447-452, July 1975.*

The combustion conditions and pollutant emissions of the G.R.C. burner with a rated throughput of 7000 kg/hr oil were studied in a 700 MW power plant. The parallel stream burner provides for a combustion air flow parallel to the burner axis, and part of the air is rotated. Using fuel oil with 2.7-3.1% sulfur, 5% excess air, and a combustion air temperature of 150 C, the total unburnt solid particulate emission was always below 1.5 g/kg of fuel, the carbon monoxide concentration was below 50 ppm, and the hydrogen content of the flue gas was below 15 ppm. The nitrogen oxides content was 260 ppm, of which fuel nitrogen accounted for over 100 ppm. The sulfur trioxide content was 18 ppm at 1.5% excess air, and 25 ppm at 4% excess air. Flue gas recirculation up to 30% increased the particulate emission to 0.9 g/kg of oil, and reduced the nitrogen oxides emission by 20% from 250 to 195 ppm at 5% air excess. Water injection reduced the particulate matter, SO3, and nitrogen oxides emissions.

56807 **APTIC NO. 81483**

Genini, Maurice and Isaac Behar

FLARE FOR BURNING GAS. *(Societe anonyme dite: Coflexip, Rueil Malmaison (France)) U. S. Pat. 3,902,843. 7p., Sept. 2, 1975. 3 refs. (Appl. March 21, 1974, 9 claims).*

A flare for burning gas in installation for exploiting or treating oil beneath the sea or in fresh water of substantial depth is described. The flare is a semi-immersed device which is mounted on a caisson which assures the flotation of the flare but is held beneath the water so as to shelter the flare from the effects of the wave action, with only the upper part of the flare remaining above the water. The flare has the advantage of permitting the semi-immersed flare to be easily mounted and maintained under constant tension by the flexible tube which is a condition which is very favorable to its long life despite the movements to which it is subject as a consequence of the agitation of the sea.

56808 **APTIC NO. 81594**

Giardini, Virgil Victor and Richard Gordon Bisker

VAPOR RECOVERY NOZZLE. *(Dresser Industries, Inc., Dallas, Tex.) U. S. Pat. 3,900,056. 7p., Aug. 19, 1975. 1 ref. (Appl. Sept. 23, 1974, 8 claims).*

An improved gasoline dispensing nozzle of the automatic shutoff type for use in connection with vapor recovery systems is described. The nozzle is positively retained in the filler neck during operation and includes a sealed vapor passageway from the tank to the vapor recovery system. Other nozzles must be manually held during filling operations, or do not have an effective gasoline-tight seal. Due to the volatility of fuels considerable vapors are generated during the filling of fuel tanks. As the vapors escape from the tank they mix with air and can form an extremely explosive mixture. This nozzle eliminates the safety and air pollution hazards caused by the escape of vapors.

56809 **APTIC NO. 81345**

Goeretz, Heinz, Erich Neinert, and Heinz Stockmann

DOSING UNIT FOR THE ADDITION OF CALCIUM CHLORIDE SOLUTION FOR COMBATING DUST. *(Dosiergeraet fuer die Zugabe von Calciumchloridloesungen bei der Staubbekaempfung). Text in German. Glueckauf (Essen), 111(21):1019-1022, Nov. 1975.*

A dosing and spray unit has been developed for dust control in coal mines. The unit prepares a spray solution with 0.13-0.4% calcium chloride and generates a spray for dust abatement. Measurements revealed that the spray reduces the fine dust concentration in the air by 30-35%, and the coarse dust concentration by 16%. The dosing unit is especially suitable for use in the longwall system.

56810 **APTIC NO. 81658**

Gorin, Everett, Metro D. Kulik, and Robert T. Struck

REMOVAL OF SULFUR DIOXIDE FROM GASES CONTAINING SULFUR DIOXIDE AND OXYGEN. *(Consolidation Coal Co., Pittsburgh, Pa.) U. S. Pat. 3,906,080. 5p., Sept. 16, 1975. 4 refs. (Appl. Aug. 19, 1974, 5 claims).*

An improvement in the selective removal of sulfur dioxide from gases containing SO2 and oxygen is described. A thiosulfate rich aqueous solution containing a sulfite forming additive is used as the selective SO2 absorbent. A gas of substantially reduced SO2 content and a substantially unchanged O2 content is obtained. The use of a thiosulfate rich aqueous solution as the vehicle or carrier for the sulfite forming additive is an improvement over other SO2 removal processes which use an aqueous absorbent selected from the class consisting of alkali metal hydroxides and carbonates and ammonium hydroxide and carbonate, because the thiosulfate solution eliminates the formation of sulfates in the scrubber.

56811 **APTIC NO. 81473**

Gosden, Derek Vernon, Anthony Roland Marshall, and David George Robson

DECONTAMINATION OF GAS PURIFICATION PROCESS EFFLUENT. *(Woodall- Duckham Ltd., Crawley (England)) U. S. Pat. 3,904,734. 6p., Sept. 9, 1975. 8 refs. (Appl. Dec. 18, 1973, 11 claims).*

A method of decontaminating the circulating reagent in a gas purification process in which the hydrogen sulfide and/or hydrogen cyanide contaminant in a foul gas stream is absorbed by a liquid reagent is described. The H2S is converted to sulfur and HCN is converted to a thiocynate. The reagent is subsequently regenerated and recycled for absorption of further contaminant. The liquid reagent is bled-off sidestream and subject to the same reduction in a fluidized bed. The gaseous products are recycled to the foul gas stream and subject to purification by the process. Any solid residue of the reduction are returned to the reagent. This process eliminates the H2S and HCN air pollutants produced in the circulating reagent of such processes as the Stretford Process.

56812 **APTIC NO. 81134**

Grant, R. A. and N. A. Gardner

OPERATING EXPERIENCE ON COMBINED INCINERATION OF MUNICIPAL REFUSE AND SEWAGE SLUDGE. *P. D. Processing Engineering, High Wycombe, Bucks, England, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux Switzerland, 1975, p. 280-286. 4 refs. (Nov. 3-5.)*

Air Pollution Control in a process for the combined incineration of refuse and sewage sludge embracing the multiple hearth or Herreshoff furnace is described. Combustion of refuse occurs primarily on the first combustion hearth. The products of combustion from both refuse and sludge pass upwards through the furnace are cooled by incoming combustion air, and are discharged to a skip by way of a twin chain water conditioning scraper conveyor. A bulky items incinerator is annexed to the plant, arranged to discharge its combustion products to the main furnace, thereby contributing to the overall heat balance. Products of combustion pass through ducts to an electrostatic precipitator and to the atmosphere through a fan and stack. The ductwork contains water sprays which provide further cooling of the gases on startup and as required in normal operation. Precipitator dust is transferred to a skip through a rotary valve and water spray conditioner.

56813 **APTIC NO. 81489**

Green, Harry W. and Ormand F. Cook

WASTE CONVERTER. *(The Standard Products Co., Cleveland, Ohio) U. S. Pat. 3,906,873. 5p., Sept. 23, 1975. 9 refs. (Appl. April 19, 1974, 4 claims).*

An improved waste disposal system is described which is very compact and which can be used on boats and other vehicles. It efficiently disposes of the liquid constituents of the sewage and traps and prevents discharge of ash and any other solid material which may remain unvaporized. The system fully consumes and oxidizes the odor causing contents of the sewage so that the discharged product is inoffensive as to odor, as well are free of living organisms. In other systems the minerals and organic solids interfere with the operation of the boiler, which is then not capable of vaporizing the waste material at the required rate. With the reduction of temperature, noxious odors are present in greater quantity.

56814 **APTIC NO. 81657**

Gregoli, Armand A. and George R. Hartos

PROCESS FOR REDUCTION OF HIGH SULFUR RESIDUE. *(Cities Service Research and Development, Co., Cranbury, N. J.) U. S. Pat. 3,905,892. 5p., Sept. 16, 1975. 4 refs. (Appl. Aug. 15, 1973, 3 claims).*

A process for disposing of the high sulfur residues resulting from the high temperature, high pressure catalytic hydrorefining of sulfur containing heavy hydrocarbon oils in which at least 95 vol% boils above 975 F is described. Essentially only low-sulfur hydrocarbon products boiling below 975 F are obtained. The process incorporates a solvent deasphalting step and a paritial oxidation of the resultant raffinate with the step of the severe catalytic hydrorefining of a vacuum or atmospheric residual oil containing significant amounts of sulfur. This combination of steps furnishes a satisfactory answer to the problem of high sulfur hydrocarbon residues, and allows refineries to meet the stringent environmental controls on sulfur emissions. The term hydrorefining includes processes such as hydrocracking, hydrodesulfurization, hydrodenitrogenation, and hydrometalization.

56815 **APTIC NO. 81543**

Gulko, Arnold. G.

FOUR STROKE ROTARY V INTERNAL COMBUSTION ENGINE. *(Assignee not given.) U. S. Pat. 3,902,466. 7p., Sept. 2, 1975. 4 refs. (Appl. Oct. 29, 1974, 12 claims).*

A four stroke rotary piston internal combustion engine is described which avoids the deficiencies associated with two stroke engines of similar design. The pistons are V-shaped and arranged in parallel in a circle with cylinders at each end. The cylinders at one end are fired in sequence; and then, while these cylinders exhaust and are recharged, the cylinders at the other end fire in sequence. The use of a four stroke engine allows for a shorter stroke, enabling fewer cylinders to be used with a shallower angle to the V.

56816 **APTIC NO. 81739**

Haines, Harry William, Jr.

VAPOR RECOVERY METHOD FOR CONTROLLING AIR POLLUTION. *(Emission Abatement, Inc.) U. S. Pat. 3,907,524. 5p., Sept. 23, 1975. 3 refs. (Appl. Dec. 13, 1973, 5 claims).*

A system for recovering hydrocarbon vapors from stored volatile liquids is described which can be easily transported from one location to another. The vapors are transmitted through a conduit to an absorbing tower where they are contacted by countercurrent flow with a lean sponge oil which absorbs the vapor. The rich sponge oil is then transmitted from the bottom of the tower to a vacuum flash tank where the vapors are desorbed or flashed from the sponge oil. The vapors are then recovered as liquid and are preferably returned to stored liquids of the same kind. The stripped or lean sponge oil is then returned to the absorbing tower where it again contacts the gases contaminated

56817 **APTIC NO. 81431**

Harmsen, Hans

ELECTRIC AUTOMOBILES FOR INNER CITY TRAFFIC. *(Elektrische Strassenfahrzeuge fuer den innerstaedtischen Verkehr). Text in German. Forum Umwelthyg., 1(2-3):52-53, 1975.*

Electrically powered and other environmentally favorable drives are reviewed on the basis of recent developments in West Germany. Daimler-Benz, Volkswagen, MAN, and Messerschmidt-Boelke-Blohm are the leading companies in the development of electrically powered vehicles. A combination of electrical and hybrid drive has been adopted by Daimler-Benz for an autobus which is operated from a battery in the city, with a diesel engine run at constant speed to recharge the battery during operation beyond the city limits. The Electrobus developed by MAN uses trailer- mounted batteries weighing 6 tons. The trailer is replaced by a new one for battery changes which takes 4 min. In addition to electric vehicles, natural gas- and propane-powered vehicles are being developed, and great importance is attached to the improvement of diesel engines.

56818 **APTIC NO. 81371**

Hartley, Danny, Marshall Lapp, and Donald Hardesty

PHYSICS IN COMBUSTION RESEARCH. *Phys. Today, 28(12):36-37, 39-41, 43, 46-47, Dec. 1975. 9 refs.*

Technical advances in combustion research to reduce emissions and improve engine efficiency are discussed. Every 1% increase in auto engine combustion efficiency saves 14.5 million barrels of oil/hr. Improved control of combustion processes result in lower pollutant emissions and reduces such hidden costs of burning fossil fuels as exhaust gas cleanup and damages to health and environment. High production costs and unacceptably high levels of hydrocarbon emission are associated with new engine concepts. Diesels after a potential for 15-20% increase in fuel economy, but present such difficulties as combustion induced noise, smoke, odor, and excessive emissions of nitric oxide. New concepts for coal fired power generating systems offer considerable challenge. Fluidized bed steam generators with integrated schemes for the catalytic removal of sulfur oxides are poorly understood and would benefit from improved combustion technology.

56819 **APTIC NO. 81675**

Hashida, Isao and Masato Nishimura

GAS ADSORPTION BY ION EXCHANGER (10). SO2 GAS ADSORPTION AND RECOVERY USING BASIC ANION EXCHANGER RESIN. *(Ion kokantai ni yoru kitai no kyuchaku (10). Kyoenkisei in-ion kikanjushi ni yoru SO2 gasu no kyuchaku to kaishu). Text in Japanese. Preprint, Chemical Society of Japan, Tokyo, p. 45, 1975. (Presented at the Japan Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975.)*

Using a porous anion exchange resin prepared from vinyl benzyl chloride and N,N,N prime, N prime-tetramethylhexamethylenediamine by suspension polymerization, the adsorption of sulfur dioxide and the possibility of SO2 recovery by desorption using heated nitrogen gas were investigated. By passing a gaseous mixture containing 20% SO2 through a column packed with a strong basic ion exchange resin in salt form (R-Cl or R-SO4) the break-through capacity, desorption rate, and concentration of SO2 removed were measured. The SO2 was adsorbed completely, desorbed almost completely by passing N2 at 150 C, and recovered with a 14-17% SO2 concentration.

56820 **APTIC NO. 81570**

Hayashi, Nobuko

A PURIFYING AND HUMIDIFYING INSTALLATION FOR POLLUTED AIR, WITH ROWS OF BLADES. *(Yokuretsu o yusuru osen kuki no seijoka, kashitsu sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 50-24744. 4p., Aug. 18, 1975. (Appl. Dec. 20, 1971, 1 claim).*

An installation for purifying and humidifying polluted air is described. Polluted air is blown into the bottom of the installation, and passes through two parallel horizontal rows of blades (bottom row, variable pitch stationary blades; top row, rotary blades) which mix the air thoroughly with liquid, which passes through the installation, perpendicular to the vertical air flow. Air-liquid mixture then passes through the eliminator, which breaks down the drops into finer particles, and is blown out through the top of the installation. A layer of liquid is maintained above the stationary blades, covering the rotary blades. A predetermined height of liquid is usually chosen, but up to 50 mm variation in liquid head is possible, by manual adjustment of a flexible tube, installed in the liquid outlet. The rotary speed of the blades ranges from 20-2000 rpm. Polluted air can be blown in at the speeds of 0.5-10 m/s, in which case, static air pressure in the installation ranges from 5-500 mm Aq.

56821 **APTIC NO. 81595**

Heilman, Gerald D. and Gordon R. Paddock

AIR DIVERTER VALVE AND CONTROLLING MEANS THEREFOR. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,905,193. 7p., Sept. 16, 1975. 5 refs. (Appl. Feb. 25, 1974, 3 claims).*

An air diverter valve for use in an emission control system for delivering air from an air pump to the exhaust system of an internal combustion engine is described. The valve permits a portion of the air flow, proportional to the intake manifold pressure density, to flow to the exhaust system. The speed density control of the air flow regulates the air flow to the exhaust system in proportion to the flow of exhaust gas. The air injection requirements of the exhaust emission control system are met throughout the range of engine air flow to achieve an improved means of reducing the concentration of under undesirable exhaust constituents. Simultaneously, the requirement for full diversion of air from the exhaust system during deceleration is met irrespective of the effect of altitude on the available manifold vacuum.

56822 **APTIC NO. 81564**

Hiramatsu, Thuyoshi

CONTROL OF NITROGEN OXIDES AND ITS RESULT. *(Chisso sankabutsu no yokusei to sono seiseki). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 41(10):899-904, Oct. 1975.*

In compliance with the new nitrogen oxides emission standard of 230 ppm for boilers, the NOx emission level of two boilers (120 t/hr and 140 t/hr) used at the Ube Industries Co. was successfully reduced to a less than 200 ppm level by modifications in operating conditions and without any structural modification. In the preliminary experiment, effects of oxygen ratio in the exhaust gas, the bias rate, the combustion air tem-

perature, the boiler load, and the wind box damper opening on NOx emissions were investigated. Low excess air combustion, bias combustion, adjustment of the wind box damper and lower combustion air temperatures were all effective for the reduction of NOx. The reduction of NOx by use of a non-stoichiometric spray burner, two-stage combustion by the burner cut method, and low nitrogen content fuel were also investigated.

56823 **APTIC NO. 81481**

Hisada, Souichi and Taro Sometani

FUEL INJECTION SYSTEMS FOR INTERNAL COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,903,850. 12p., Sept. 9, 1975. 2 refs. (Appl. June 12, 1973, 14 claims).*

A fuel injecting system for gasoline internal combustion engines is described which gives engine cylinders a fuel-air mixture suitable for various situations of engine operation. A fuel injecting system is required in which the injection of fuel can adjust to the rpm of the engine, the negative pressure in the intake pipe, and the temperature in the intake pipe. For changing the injection interval of fuel injection water valves of nozzles, a pulse transformer is utilized which comprises a saturable magnetic core of a rectangular hystereisis loop, an input winding, control windings such as a bias winding and a speed winding, and an input winding. This transformer overcomes the lack of many-sides controls in a mechanical system and the excessive cost of electronic systems.

56824 **APTIC NO. 81547**

Hoag, Harry J., Jr. and Alvis M. Rawlinson

METHOD AND APPARATUS FOR PRODUCING FIBERS AND ENVIRONMENTAL CONTROL THEREFOR. *(Owens-Corning Fiberglas Corp., Toledo, Ohio) U. S. Pat 3,902,878. 13p., Sept. 2, 1975. 4 refs. (Appl. May 21, 1971, 9 claims).*

A process for forming fibers of glass or other heat softenable materials is described which reduces emissions of vaporized solvents, organic particulates, and binder solids. The method involves engaging centrifuged streams of the heat-softened material by an annular gaseous blast and delivering a vaporizable medium to the attenuating or fiberizing zone to cool the fibers to a temperature at which the binder may be applied with a minimum of volatilization and loss of binder constituents. (Author abstract modified)

56825 **APTIC NO. 81672**

Honda, Koichi, Tomoyoshi Hachiya, and Masahiko Takesada

REACTION BETWEEN METAL SALT OF AMINO ACID AND NITRIC OXIDE. (2). EFFECT OF OXYGEN ON REACTION. *(Aminosan kinzokuen to issanka chisso to no hanno. (2). Hanno ni oyobosu sanso no eikyo). Text in Japanese. Preprint, Chemical Society of Japan, Tokyo, p. 31, 1975. 1 ref. (Presented at the Japan Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975.)*

The effect of oxygen on nitric oxide reduction was investigated using ferrous salts of glutamic acid and acetic acid. A gaseous mixture of helium, NO (1570 ppm), and O2 (6.5%) was passed through a glass column filled with an aqueous solution of ferrous glutamate (monosodium glutamate 0.98 mole, ferrous sulfate 0.49 mole), and the removal rate of NO, consumption rate of O2, and formation amount of nitrous oxide were measured. Concentrations of ammonia, nitrite ion and nitrate ion in the reaction solution were also determined. The NO removal rate was 90-98%, the consumption rate of O2 was 20-25%, and no formation of N2O was observed. The amount of NH3 produced was about equivalent to the amount of NO removed, and micro-amounts of NO2(-) and NO3(-) were also found. No decrease in glutamic acid concentration in the reaction solution was observed. Using ferrous acetate with a gaseous mixture containing 520 ppm of NO and 2.3% of O2, the NO removal rate was 70-90%, the consumption rate of O2 was 15-20%, and no formation of N2O was observed. The amount of NH3 in the reaction solution was about equivalent to the amount of NO removed. Therefore, the NH3 was considered to be the reduction product of NO. The effect of SO2 on NO reduction in the presence of O2 was investigated; the presence of NO2 had no effect on the reduction of NO to NH3.

56826 **APTIC NO. 81222**

Horiike, E.

EXAMPLE OF DENITRIFICATION TECHNOLOGY BY KYOWA METHOD. *(Kyowa ho ni yoru dassho gijutsu no jitsurei). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(9):68, Sept. 1975.*

The waste gas denitrification method of the Kyowa Chemical Industrial Co. is described. The method is a wet type process using sodium monosulfide which absorbs nitrogen oxides in an absorption tower. Multi-absorption towers are used in series to achieve higher denitrification efficiency. The treatment of the gas generated during a copper metal surface operation using 65% nitric acid yielded more than 95% denitrification efficiency with three absorption towers. The maximum efficiency obtained in 19 experiments was 99.7% for NOx concentrations ranging from 420 ppm to 5000 ppm. If the waste gas contains hydrogen sulfide gas, the sodium monosulfide can be generated by using a sodium hydroxide solution. The method is not suitable for treating waste gas containing high concentrations of nitric oxide, since its absorption by Na2S is difficult. However, the method is especially good if the waste gas contains a high ratio of other nitrogen oxides to NO. In the former case, the oxidation of NO to NO2 by a strong oxidizing agent is necessary.

56827 **APTIC NO. 74433**

Idemura, H.

DEVELOPMENT ON THE STACK-GAS DESULFURIZATION PROCESS OF CHIYODA THOROUGHBRED 101. *(Chiyoda saraburedo 101 haien datsuryu purosesu no kaihatsu). Text in Japanese. Preprint, The Japan Society of Chemical Engineering, Tokyo, 8p., 1975. 8 refs. (Presented at the Japan Society of Chemical Engineering, Lecture Meeting on Industrialization and Research, 11th, Tokyo, Japan, Jan. 30, 1975.)*

The Chiyoda Thoroughbred 101 desulfurization process is described. The process consists of an absorption-oxidation step for sulfuric acid formation and a gypsum formation step. Flue gas is cooled to 50-80 C and is supplied to the bottom of an absorption tower to which 2-3% diluted sulfuric acid is introduced. Sulfur dioxide is absorbed, and the resulting gas is released. The absorbed SO2 is oxidized by oxygen with the aid of an iron catalyst, and part of the resulting sulfuric acid is removed. The remaining sulfuric acid is allowed to react with limestone, and gypsum is formed. At an SO2 concentration of 1000 ppm and a liquid/gas ratio of 60 l/normal cu m, the rate of desulfurization is as high as 95%. Test results indicate that the iron catalyst is not poisoned by many organic and inorganic compounds at various concentrations, whereas a manganese catalyst is strongly poisoned by sodium nitrite at 30 ppm and vanadium pentoxide at 100 ppm. The process is being utilized at six plants treating flue gases ranging from 14,070 normal cu m/hr to 100,000 normal cu m/hr. The rate of desulfurization ranges from 91% to 97.5%. A Thoroughbred 102 process, which combines desulfurization and denitrification, is also developed.

56828 **APTIC NO. 77896**

Irving, William M.

MAGNESIUM OXIDE SCRUBBING EXPERIENCE ON OIL FIRED ELECTRIC GENERATING UNIT AT BOSTON EDISON S MYSTIC STATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-64.3.)*

A full size prototype pollution abatement system was installed and operated on a 150 MW oil fired electrical generating unit. The system was designed to control sulfur dioxide (SO2) emissions when burning a high sulfur fuel oil in the boiler. A 2 yr test program demonstrated that magnesium oxide scrubbing is technically feasible. High SO2 removal efficiencies were maintained, the product of scrubbing, magnesium sulfite, was calcined and MgO was regenerated, and 5000 tons of commercial grade 98% sulfuric acid were produced and sold. Various mechanical and process problems prevented continuous, reliable operation. Scrubber availability was a low 17% during the first year. Availability over the last 4 months was 76%. (Author abstract modified)

56829 **APTIC NO. 74395**

Itakura, K., C. Hayashi, R. Kojima, H. Ikeda, and K. Kaneko

FLUE GAS DESULFURIZATION IN REVERBERATORY FURNACE OF COPPER SMELTING. *(Do seiren hansharo no haien datsuryu). Text in Japanese. Ryusan to Kogyo (Sulfuric Acid Ind.), 28(2):29-35, Feb. 1975. 4 refs.*

The use of limestone-gypsum and magnesia slurry desulfurization processes for treating flue gas from reverberatory furnaces at a copper smelter is described. The flue gases were treated by either process, and the treated gases were combined after desulfurization and discharged from the same chimney. The employment of the two processes prevented the overproduction of gypsum or sulfuric acid. The magnesium oxide method induced reacting magnesium hydroxide solution with sulfur dioxide to magnesium sulfite which was separated from the solution by a centrifugal separator. The magnesium sulfite was heated to 800 C in the presence of carbon powder and decomposed into magnesium oxide and concentrated sulfur dioxide. The carbon powder prevented the formation of magnesium sulfate. The MgO produced was then treated with water to regenerate the magnesium hydroxide, while the concentrated SO2 was used for the sulfuric acid production. Each of the reverberatory furnaces emitted 1530 normal cu m/min flue gas containing 2.4% SO2. This SO2 level was reduced to less than 100 ppm by either of the two desulfurization processes.

56830 **APTIC NO. 81223**

Iwatsubo, Haruo

SARC DENITRIFICATION METHOD. *(SARC dassho hoshiki ni tsuite). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(9):47, Sept. 1975.*

The flue gas denitrification process of the Seitetsu Chemical Industrial Co. is described. The process is a catalytic ammonia reduction method in which an iron oxide catalyst in a doughnut shape is used. As long as the reaction temperature is kept above 400 C, flue gas denitrification occurs by passing the flue gas through the catalyst. The results obtained from a pilot plant with a capacity of 15,000 N cu m/hr indicate that 90 to 93% of the initial 150 ppm nitrogen oxides could be removed from the boiler waste gas. A similar denitrification efficiency could be expected even if the plant capacity were increased up to 1,000,000 N cu m/hr. No poisoning of the catalyst could be observed up to 960 hours of continuous operation, and the catalyst can be expected to last 1 year. The process can be used even if the flue gas contains sulfur oxides and dusts as long as a reaction temperature above 400 C and an SV value of 3000 is used, so that the clogging of the catalyst can be avoided. A practical molar ratio between added ammonia and NOx in the flue gas of between 1.2 to 1.5 is necessary in order to achieve high denitrification efficiency.

56831 **APTIC NO. 81642**

Jackson, Delma J. and John D. Medrick

TWO PHASE CHOKE SYSTEM WITH PRIMARY AND SECONDARY HEATING. *(Ford Motor Co., Dearborn, Mich.) U. S. Pat. 3,906,912. 7p., Sept. 23, 1975. 4 refs. (Appl. Nov. 16, 1973, 13 claims).*

A two-phase choke system with primary and secondary heating is described which provides cold weather starts for an engine and at the same time minimizes the output of emissions. Other chokes provide a richer than normal mixture for cold weather starting, which increases carbon monoxide emissions. This choke provides a leaner than normal air/fuel mixture sooner than is conventional after the start of a warm engine by pulling open the choke valve faster than by conventional choke systems. Construction includes a temperature responsive, secondary heating apparatus operable above a predetermined ambient temperature to shorten the length of time required for the normal operation of an automatic choke.

56832 **APTIC NO. 74419**

Kamisaka, Akira, Kenichi Oishi, and Masaaki Sugiyama

THE OPERATING RESULT OF THE COG DESULFURIZATION PLANT BY FUMAKS PROCESS. *(Fumakkusu-ho ni yoru COG datsuryu no sogyo jisseki). Text in Japanese. Aromatikkusu (Aromatics), 27(4):174-176, 1975.*

A coke oven gas desulfurization process (Fumaks process) at an iron manufacturing plant is described that uses ammonia solution to absorb hydrogen sulfide and hydrogen cyanide in a reaction tower. The reacted ammonia is regenerated by using picric acid. The liberated sulfur is removed from the solution. The salt concentration of the absorbing solution is maintained at 60 wt% by removing a part of absorbing solution. The removed absorbing solution is combusted at 1100 C together with the separated sulfur and is decomposed into nitrogen, carbon dioxide, water, and sulfur dioxide; the latter is used to manufacture sulfuric acid. An iron manufacturing plant using two absorption towers in parallel achieves 95% desulfurization after the first and 99.5% after the second tower. The desulfurization facility is capable of treating 90,000 normal cu m/hr of coke oven gas, and the treated gas contains less than 0.03 g/normal cu m of H2S and 0.03 g/normal cu m of HCN. The production rate of 98% sulfuric acid is 34.5 ton/day; the sulfuric acid contains more nitric and nitrous acid than commercial sulfuric acid but is adequate for ammonium sulfuric production.

56833 **APTIC NO. 81344**

Kamm, K.

CONVEYING AND LOADING PLANT FOR CLINKER AND CEMENT AT THE LIMHAMM CEMENT WORKS IN SWEDEN. *(Tranport- und Verladenlage fuer Klinker und Zement im Zementwerk Limhamn/Schweden). Text in German. Zement-Kalk-Gips (Wiesbaden), 28(10):407-409, 1975.*

A curved belt conveyor, 1850 m in length, and a quay loading installation for loading seagoing ships with cement and clinker from the Linhamn Cement Works of Cementa AB, Sweden is described. All material transfer points along the conveyor belt are equipped with filter type dust separators. The discharge end of the feeding conveyor on the quay is equipped with bag filters for dust separation. Loading special cement ships with their cargo space under reduced pressure generates no marked dust emissions, but the loading of clinker entails dust emission. This problem should be solved by the use of special clinker ships.

56834 **APTIC NO. 81677**

Kasaoka, Shigemitsu and Kazutoshi Takamatsu

GASEOUS PHASE CATALYTIC OXIDATION AND DEODORIZATION OF VARIOUS ORGANIC COMPOUNDS. *(Kakushu yuki kagobutsu no kiso sesshoku sanka, dashu). Text in Japanese. Preprint, Japan Society of Chemical Engineers, Tokyo, p. 213-214, 1975. (Presented at the Japan Society of Chemical Engineers, Autumn Conference, 9th Fukuoka, Oct. 17-20, 1975.)*

A basic study of an oxidation deodorization method for industrial malodor is described. The oxidation reactivity of benzene, toluene, o-xylene, ethyl benzene, formaldehyde, diethyl phthalic acid and ethyl acrylic acid were investigated using platinum and palladium catalyst. The effects of the preparation method of the catalyst and of water vapor on the oxidation rate were investigated. The oxidation activity of Pt catalysts prepared by immersing alumina in an ethanol solution of Pt salt was higher compared to that immersed in an aqueous solution, and its activity was comparable to that of hydrogen reduced catalysts. The reasons for such a difference in activity with solvent type are not known.

56835 **APTIC NO. 81678**

Kasaoka, Shigemitsu and Hisashi Nagisa

CATALYTIC OXIDATION OF NH3 BY O2. *(NH3 no O2 ni yoru sesshoku sanka). Text in Japanese. Preprint, Society of Chemical Engineers, Tokyo, Japan, p. 211-212, 1975. 2 refs. (Presented at the Japan Society of Chemical Engineers, Autumn Conference, 9th, Fukuoka, Oct. 17-20, 1975.)*

The catalytic oxidation of ammonia to nitrogen using oxygen was investigated for the purpose of establishing a treatment method for excessive NH3 in the denitrification process by catalytic reduction of nitrogen oxides with NH3. Various types of platinum and palladium catalyst, 0.3 wt% Pt-alumina (aq, EtOH); 0.3 wt% Pd-alumina (aq, EtOH); and 0.3 wt% Pt-0.3% Pd-alumina (aq, EtOH, reduction product); and the effects of preparation methods and oxidation conditions were investigated by measuring the conversion rate of NH3, the formation rate of NO, and selectivity. The reduction product of Pt-Pd catalyst used at temperatures in the vicinity of 275-300 C was found to be most effective.

56836 **APTIC NO. 81237**

Kawasaki, Shozo and Zenichi Mori

SUMITOMO CHEMICAL TYPE STACK GAS DENITRIFICATION PROCESS. *(Sumitomo kagakushiki haien dassho purosesu). Text in Japanese. Ryusan To Kogyo (Sulphiric Acid Ind.), 28(10):229-235, Oct. 1975. 6 refs.*

A catalytic stack gas denitrification process, for clean stack emissions (no SOx or dust), developed by Sumitomo Chemical, in operation since May 1974, is described. Base metal catalysts, on alumina carrier, are used in the reaction of ammonia with nitrogen oxides to form nitrogen and water. The fuel used in the furnace is off-gas and liquefied petroleum gas. As an example, the amount of stack gas treated was 200,000 N cu m/hr, at reaction temperatures near 300 C. The ratio of NH3/NOx was about 1.0. The inlet gas compositions consisted of about 200 ppm NOx, and about 7% O2. The outlet gas compositoins consisted of less than 20 ppm NOx, and less than 10 ppm NH3. The denitrification rate was 90%. Denitrification at the plant level followed predicted theoretical and test model behavior. In the spring of 1973, before the oil crisis, construction costs were $83 million. Ground space for the installation was 25 m by 15 m. The amount of NH3 consumed was 30 kg/hr; 800 kW of electricity were used. The cost of denitrification was from $0.33-0.40/1000 N cu m stack gas; or $3.33/ton methanol.

56837 **APTIC NO. 81192**

Kawawata, Shichiro and Norio Takahata

LESS AIR POLLUTING FLAME RETARDANT VINYLS FOR CABLE COVERING. *Japan Plast. Age, vol. 13:43-47, Sept.-Oct. 1975. 9 refs.*

The development of flame retardant polyvinyl chloride (PVC) cables which are highly nonflammable and emit less smoke and toxic gases when burnt is described. When burned, PVC turns into gases, mainly carbon dioxide, carbon monoxide, hydrogen chloride, and water and solid substances like carbide and ash and smoke. Vinyl resin contains 57% chlorine atoms and when burned; this turns into nonflammable HCl. The PCV emits smoke during thermal decomposition and burning, but the black smoke is mainly composed of solid microfine particles. Hydrogen chloride emission can be reduced by adding a capturing agent to the vinyl compound. Smoke emissions can be decreased by reducing the quantity of additives that contain a high ratio of carbon atoms (i.e., aromatic rings). A less polluting, flame resistant PVC was successfully developed. It has properties very close to those of compounds generally used for cable insulation and sheathing. The quantity of HCl is about 1/30 that of the conventional grades and the smoke quantity is about 1/3.

56838 **APTIC NO. 81650**

Kelleher, Raymond L., Ivan A. Shirk, and Timothy J. O Leary

METHOD FOR REMOVING POLLUTANTS FROM COMBUSTION PRODUCTS GENERATED BY HYDROCARBON FUEL COMBUSTION, AND SYSTEM THEREFOR. *(The Corp. of Gonzaga Univ., Spokane, Wash.) U. S. Pat. 3,905,784. 9p., Sept. 16, 1975. 4 refs. (Appl. June 29, 1971, 13 claims).*

A method for removing pollutants from industrial exhaust gases (such as the combustion products generated by combustion of hydrocarbon fuels) is described. Prior systems have not maximized water removal and removal of water soluble pollutants preliminary to dishcarge of the effluent gases. The effectiveness of pollutant removal in terms of removal of water and water soluble pollutants from the hydrocarbon fuel combustion products is increased several fold by refrigeration of the products of combustion to substantially water freezing temperature at substantially atmospheric pressure.

56839 **APTIC NO. 81330**

Ketjen, G. T.

ABATEMENT OF SULFUR DIOXIDE EMISSIONS AT THE AKZO CHEMIE SULFURIC ACID PLANT AT AMSTERDAM-NOORD. *(Vermindering van zwaveldioxide emissie bij de zwavelzuurfabricage van Akzo Chemie te Amsterdam-Noord). Text in Dutch. Chem. Weekblad, no. 29:11-13, 15, July 18, 1975.*

A method is described for the reduction of sulfur dioxide emissions during the production of sulfuric acid. The procedure provides for the catalytic oxidation of sulfur dioxide at 450 C in a large excess of oxygen to sulfur trioxide with the resulting sulfur trioxide being absorbed in sulfuric acid. The exhaust gas containing 0.4% sulfur dioxide is then subjected to further oxidation with the resulting heat sufficient to continue the process without further energy investment. The conversion yield is 99.7%.

56840 **APTIC NO. 81063**

Kimbrough, William C. and Lonnie E. Dye

PYROLYSIS OF SEWAGE SLUDGE AND REFUSE COMBINED. *Rust Engineering Co., Birmingham, Ala. and Minneapolis-St. Paul, Minn., Metropolitan Waste Control Commission, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 287-292. (Nov. 3-5.)*

The environmental effects of a process for the pyrolysis of sewage sludge and refuse combined are discussed. Pyrolysis off-gas is routed to a direct contact condenser and tray tower, which condenses tars, oils, and water vapor. These fractions are transferred to an oil-water separator from which the tars and oils are removed to storage. The process water is transferred directly to the aeration tanks of an adjacent secondary biological treatment plant. The clean product fuel gas is compressed, dried, and stored under pressure for use as fuel. Air pollution control is carefully designed to collect odorous streams such as air classifier recycle air bleed and dryer off-gas and to route them to combustion units on the pyrolysis oven or to odor incinerators.

56841 **APTIC NO. 81738**

King, Donald E.

VENTILATING SYSTEM WASHER CLEANING APPARATUS. *(Ayr King Corp., Louisville, Ky.) U. S. Pat. 3,907,525. 9p., Sept. 23, 1975. (Appl. July 12, 1973, 2 claims).*

A device for removing grease vapors, odors, and smoke from ventilating systems is described that eliminates problems of grease accumulation associated with electrostatic precipitators used in such applications. The apparatus combines a cold water spray and a water-cooled centrifugal extractor in combination with an electrostatic precipitator. The centrifugal extractor and cold water curtain are directed generally counter to the flow of the ventilating airstream and serve to remove and wash away heavier grease vapors and the larger smoke particles prior to the entry of the airstream into the precipitator cell area.

56842 **APTIC NO. 81653**

Kirkbride, James W.

REDUCTION AND CONTROL OF ATMOSPHERIC POLLUTANTS EMITTED FROM GASOLINE POWERED INTERNAL COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,906,914. 10p., Sept. 23, 1975. 11 refs. (Appl. April 4, 1973, 4 claims).*

An apparatus for the reduction and control of atmospheric pollutants emitted from gasoline powered internal combustion engines is described. The emissions of unburned hydrocarbons, carbon monoxide, and oxides of nitrogen are significantly reduced by converting the gasoline to its gaseous state and simultaneously causing the isotropic mixing of gasoline and oxygen molecules. This is achieved without any significant increase in the temperature of the total fuel/air mixture, and without restricting the area of the air/fuel flow path. Volumetric efficiency is not degraded, and more efficient combustion results. Unlike other systems which convert gasoline to its gaseous state by preheating the total mixtures, this system causes the gasoline droplets to splash onto a heating element, thereby causing instant boiling of the fuel droplets. The temperature is controlled so it is directly proportional to the speed of the engine. This permits instantaneous reduction in heat capacity at low gasoline flow, so as not to flash the fuel.

56843 **APTIC NO. 81661**

Kitami, Yoshiaki

DUST COLLECTING APPARATUS. *(Senko Kikai Kabushiki Kaisha, Nagoya (Japan)) U. S. Pat. 3,901,671. 5p., Aug. 26, 1975. 2 refs. (Appl. July 23, 1974, 1 claim).*

A dust collecting apparatus adapted to remove dust particles from a dust particle laden gas and discharge the cleaned gas into the environment is described. The collecting apparatus has a hollow cylindrical fabric filter member for removing dust particles from a gas. A gas inlet tube extends longitudinally in the fabric filter member from the lower end to an intermediate portion and is capable of applying oscillation to the filter member wall to shake off dust particles while the dust collecting operation is being performed. Unlike other collectors, the operation of the apparatus does not have to be shut down to improve the dust collecting efficiency.

56844 **APTIC NO. 81064**

Kitaoka, Y. and H. Mineshima

UTILIZATION OF WASTE ATACTIC POLYMER AS A BOILER FUEL. *Mitsui Shipbuilding and Engineering Co., Ltd., Ichihara, Japan, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st. Montreux, Switzerland, 1975, p. 544-549. (Nov. 3-5.)*

The utilization of waste atactic polypropylene (APP) as a boiler fuel is described. The combustion chamber is separated from the tube bundle of the boiler because APP is poorer in ignition quality and requires a longer time for complete combustion than conventional fuel oil. No special devices for exhaust gas cleaning are incorporated, since APP does not include any harmful pollutants such as sulfur and ash. Burners are adapted to respond to the fluctuation of the amount of APP discharged. An economic analysis of a boiler in use is given.

56845 **APTIC NO. 78772**

Klimisch, Richard L. and Kathleen C. Taylor

CATALYTIC REDUCTION OF NITRIC OXIDE ON RUTHENIUM. *Ind. Eng. Chem. Prod. Res. Develop., 14(1):26-29, March 1975. 10 refs. (Presented at the California Catalysis Society, Fall Meeting, Pasadena, Calif., Nov. 2, 1973.)*

The catalytic reduction of nitric oxide by carbon monoxide and hydrogen over a supported ruthenium catalyst was investigated using a feed stream resembling an automotive exhaust. The effect of space velocity and various reactant concentrations on the ammonia/nitrogen product distribution were studied along with the effect of these various parameters on the rate of NO removal. The pertinent chemical reactions in this system and the limitations imposed by an exhaust gas feed stream are discussed. The temperature required to remove NO increases with increasing NO concentration. The oxygen treated and reduced forms of the ruthenium catalyst show only slight differences in their activity for NO removal. Nitric oxide concentration has a significant effect on product distribution. As the NO concentration is increased, the fraction converted to ammonia decreased for both forms of the catalyst.

56846 **APTIC NO. 81185**

Knoblauch, K., H. Juentgen, J. Schwarte, and H. Grochowski

OPERATING EXPERIENCES WITH FLUE GAS DESULFURIZATION. *(Betriebserfahrungen mit der Rauchgasentschwefelung). Text in German. Chem. Ind. (Duesseldorf), 27(8):457-461, Aug. 1975.*

Experience with a new desulfurization process adopted for a 350 MW unit at the Kellermann power plant at Luenen, West Germany, is presented. The flue gases are desulfurized without preliminary cooling at 110-150 C on activated coke in a traveling layer reactor, after which the coke is removed from the reactor and mixed with hot sand for desorption at 650 C. The SO2 which is present at concentrations of 30% by volume or higher, is reduced to hydrogen sulfide with heating gas, and finally to elementary sulfur in a modified Claus process.

56847 **APTIC NO. 74499**

Kobayashi, H. and K. Furuyashiki

PRESENT STATE OF LOW NOX BOILER, BURNERS AND THEIR ACTUAL EXAMPLES. *(Genjo ni okeru tei NOx boira bana to sono jitsurei). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(5):70-74, May 1975.*

Nitrogen oxides pollution can be controlled by fuel conversion, combustion modification (fuel NOx, thermal NOx, prompt NOx), denitrification of flue gas, and diffusion by high smoke stacks. In the case of medium and small sized boilers, the fuel conversion and combustion modification techniques are more feasible, while denitrification of flue gas can be considered in the case of large-sized boilers. The NOx emission of fuel return type combustion systems is reduced greatly compared to that of non-return type combustion systems; 40-50% for A heavy oil and 20-30% for B and C heavy oil. In the case of non-return type combustion systems using A heavy oil, the NOx emission is reduced 28-30% by two-stage combustion, 43-54% by two-stage combustion and steam injection, 14-19% by exhaust gas recirculation, and 49-55% by exhaust gas recirculation and steam injection. The NOx reduction by the multistage combustion, decrease in load, steam or water injection, and exhaust gas recirculation are discussed with equations for NOx reduction rate. The relationships between NOx emission and air ratio or boiler capacity are also discussed.

56848 **APTIC NO. 81659**

Koetting, Wolfgang

APPARATUS FOR THE REMOVAL OF MALODOROUS COMPONENTS FROM GASES. *(Steuler Industriewerke G.m.b.H, Hohr-Grenzhausen (Federal Republic of Germany)) U. S. Pat 3,905,774. 5p., Sept. 16, 1975. 9 refs. (Appl. June 20, 1972, 6 claims).*

A process for the removal of malodorous particulate matter (decomposition products of organic substances in particular) entrained in waste gases and/or fumes is described. Both direct flame combustion and catalytic combustion can remove malodorous particulate matter, but these methods are expensive. This process is low-cost and includes an apparatus consisting of an absorption tower incorporating a plurality of capillary washing plates arranged one above the other in stages, with streams of washing fluid circulating at a variable level. The effluent gases and/or fumes with the entrained malodorous particulate matter are fed from below under positive pressure and impinge upon the underside of the washing plates and penetrate the washing fluid.

56849 **APTIC NO. 81717**

Koda, Kichiro

METHOD OF PREVENTING FORMATION OF HARMFUL COMBUSTION GASES IN COMBUSTION FURNACE. *(Denyo Kagaku Kogyo Kabushiki Kaisha, Tokyo (Japan)) U. S. Pat. 3,905,745. 5p., Sept. 16, 1975. 4 refs. (Appl. Dec. 17, 1973, 5 claims).*

A method is provided for considerably reducing the harmful constituents of exhaust gases ejected into the atmosphere from the combustion chamber of a combustion furnace. It also contributes to the improvement of combustion efficiency and the reduction of fuel consumption. A mixture of oxygen and either an inert gas or the exhaust gas from the combustion chamber is substituted for practically the whole quantity of air fed to the combustion chamber. This prevents the production of nitrogen oxides during combustion. (Author abstract modified)

56850 **APTIC NO. 81465**

Kravitz, Stanley, Jitendra A. Patel, and William A. Mather, Jr.

HYDRODESULFURIZATION OF HEAVY PETROLEUM OIL AT HIGHER TEMPERATURES AND SPACE VELOCITIES. *(Texaco Inc., New York) U. S. Pat. 3,915,848. 4p., Oct. 28, 1975. 3 refs. (Appl. Dec. 7, 1973, 13 claims).*

A process is claimed for the hydrodesulfurization of a petroleum oil fraction having an initial boiling point of at least about 500 F in the presence of added hydrogen. The heavy hydrocarbon oils are desulfurized at high temperature and high space velocity in the presence of a catalyst comprising a Group VIII metal and a Group VI metal or their compounds and also containing, as an agent for reducing the deactivation rate of the catalyst, a small amount of a Group VII metal or compounds. The throughput of desulfurization of a unit may be increased and the hydrogen consumption in the desulfurization procedure may be reduced. (Author abstract modified)

56851 **APTIC NO. 81362**

Kudo, Tetsuichi, Toshikatsu Manabe, Kazuetsu Yoshida, Tetsuo Gejyo, and Michiharu Seki

METHOD FOR REDUCING NITROGEN OXIDES. *(Hitachi, Ltd. (Japan)) U. S. Pat. 3,914,390. 18p., Oct. 21, 1975. 6 refs. (Appl. Sept. 18, 1973, 23 claims).*

Catalysts for conversion of nitrogen oxides, consisting of a porous ceramic carrier, and 0.1 to 10% by weight of copper oxide in terms of copper metal, 0.1 to 20% by weight of lanthanum oxide in terms of lanthanum metal, and 0.01 to 12% by weight of zirconium oxide in terms of zirconium metal, based on the weight of the carrier on which these oxides are supported, are described. The catalysts can be used for flue gas or for the exhaust gas from internal combustion engines. The catalysts are brought in contact with a gas containing nitrogen oxides in the presence of ammonia, thereby decomposing and converting the nitrogen oxides. Sulfur oxides may also be present. (Author abstract modified)

56852 **APTIC NO. 81336**

Kurihara, M.

TREND OF AUTOMOBILE CATALYTIC CONVERTORS AND RELATED DEVICES. *(Jidosha yo shokubai sochi to kanren kiki no koko). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 14(166): 26-34, May 1975.*

Automotive emission control standards for carbon monoxide, hydrocarbons, and nitrogen oxides are 2.1, 0.25, and 1.2 g/km for 1975 and 2.1, 0.2, 0.6, and 0.85 g/km for 1976, which are much more severe than those in the U. S. At the present stage, if the catalytic reduction method is adopted for NOx treatment, then HC and CO will be treated by oxidation convertors or thermal reactors after the removal of NOx. Many reduction catalysts for NOx have been studied; however, none are ready for practical application due to the insufficient durability and problem of ammonia formation. The durability of catalyst is discussed with data from two major models of domestic car. Descriptions of dual catalytic convertors, which consist of the combination of reduction convertor and oxidation convertor, are given with emission data for NOx, HC, and CO, durability test data, and schematic diagrams of convertors. The reduction mechanism for NOx and durability data for NOx reduction catalysts (low NH3 formation catalyst) are given. Descriptions of the oxygen sensor used for air-fuel ratio control, which is required for the three-way convertor and dual bed convertor, and secondary air injection system are given. Problems of secondary pollution caused by the use of catalytic convertor are also discussed.

56853 **APTIC NO. 81062**

Landman, W. J. and W. J. Darmstadt

ENERGY RECOVERY FROM SOLID WASTE. *Hempstead, N. Y., Dept. of Sanitation and Parsons and Whittemore, Inc., New York, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 590-595. (Nov. 3-5.)*

The environmental effects of the totally integrated 2000 ton/day Hydrapulping (wet shredding) resource recovery plant for Hempstead, N. Y. are described. The physical properties and combustion characteristics of solid waste prepared fuel are very similar to bark. A comparison of the analysis of bark and prepared fuel, after extraction and recovery of metal and glass, is tabulated. The Resource recovery operation complies with local, state, and Federal emission standards. A prepared fuel boiler furnace is arranged with dual particulate collection equipment. Each unit includes a mechanical dust collector followed by high efficiency electrostatic precipitators.

56854 **APTIC NO. 81545**

Lay, Joachim E.

ROTARY INTERNAL COMBUSTION ENGINE. *(Assignee not given.) U. S. Pat. 3,902,464. 10p., Sept. 2, 1975. 5 refs. (Appl. Nov. 7, 1973, 9 claims).*

A sliding abutment rotary internal combustion engine with positive fuel-air compression is described. The fuel-air mixture is inletted directly into each firing chamber. The engine consists of dual eccentric rotors on a common shaft. While one rotor is inletting and then compressing the fuel-air mixture through a first 360 deg of shaft rotation, the other rotor is providing fuel-air combustion. The combustion products then exhaust through a second 360 deg of shaft rotation. Chambers formed by the rotors, abutment, and engine housing are fired in sequence around the first rotor housing and then in sequence around the second rotor housing through 720 deg of shaft rotation.

56855 **APTIC NO. 81737**

Lee, Merle D. and Lloyd R. Lee

AIR FILTER FOR AN OIL BURNER. *(Raymond Lee Organization, Inc., New York) U. S. Pat. 3,907,531. 3p., Sept. 23, 1975. 9 refs. (Appl. Oct. 1, 1974, 1 claim).*

An air intake filter for an oil burner is described. The air filter consists of a strip of flexible air filtering material of any suitable type such as glass, wool, or the like. Cords affixed to and extending from the ends of the strip are provided for tying the strip around the air intake of the oil burner. Air drawn into the oil burner is thus filtered. (Author abstract modified)

56856 **APTIC NO. 81607**

Lees, B. and R. W. Butcher

REDUCING ATMOSPHERIC POLLUTION FROM OIL-FIRED PLANT: DEVELOPMENT OF GRIT-ARRESTING CYCLONES FOR MULTI-FLUE CHIMNEYS. *J. Inst. Fuel, vol. 167:201-207, Dec. 1975 5 refs.*

Smut emission and chimney corrosion in oil-fired plants can be avoided if chimneys are designed to ensure that their inner furfaces are maintained at temperatures above the acid dewpoint. One method of achieving this objective is to adopt multiflue chimneys. A cyclone has been designed to fit beneath each of the flues, utilizing the space in the base of the multiflue chimney. Cyclones fitted in this position are inconspicuous. They are insulated from ambient cooling and therefore are not subject to corrosion or blockage. With a flue gas exit velocity from the cyclone of 12 m/sec the pressure drop across the cyclone is approximately 50 mm wg. It can be fitted to most oil fired plants, either without modification to the plant or with a moderate increase in boiler fan capacity. The height may be reduced without loss of efficiency, but the pressure drop increases slightly above 50 mm wg. The efficiency of the cyclone is adequate to enable the plant to operate at levels of grit and dust emission well below those allowed by the Clean Air Acts in the United Kingdom and similar regulations in other countries. The concentration of unburned solids at the outlet from the cyclone is well below 0.1% of the fuel consumed on a small industrial boiler. The cyclone removes from the flue gases nearly all the unburned solids above 10 micron diameter. There is no appreciable deterioration in performance in long period trials, and there is no evidence of low temperature attack. The new design will help to reduce the emission of acidic smuts. (Author abstract modified)

56857 **APTIC NO. 78509**

Leith, David and Melvin W. First

PARTICLE COLLECTION BY A PULSE-JET FABRIC FILTER. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 16 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-57.1.)*

The fly ash collection characteristics of a pulse jet fabric filter were investigated. Fly ash penetration decreases as the dust deposit increases from zero to 60 micrometers in thickness, increases as face velocity through the bags increases from 5 to 1 15 cm/s, and remains relatively constant for particles from 0.3 to 4.0 micron in diameter. Experiments employing chemically tagged fly ash were performed to investigate three dust penetration mechanisms. Penetration by straight through dust loss falls off rapidly after cleaning, reaches a minimum, and then increases. Seepage of dust through the fabric is constant throughout the filtration cycle. Dust lost as pinhole plugs increases after cleaning, passes through a maximum, and then declines. The pinholes open the way for further emission by the straight through mechanism. When operated at 5 cm sec face velocity, the straight through mechanism accounts for most of the dust released over many filtration cycles. At 15 cm/sec velocity, most dust penetrates as pinhole plugs. (Author abstract modified)

56858 **APTIC NO. 81415**

Litvinov, A. T.

CALCULATION OF THE DIMENSIONS OF GRAVITY EQUIPMENT AND EFFICIENCY OF DUST REMOVAL. *J. Appl Chem. USSR (English translation from Russian of: Zh. Prikl. Khim. (Leningrad), 47(8):1826-1829, Jan. 15, 1975. 2 refs.*

Disregard for the inertial path of particles in gravity equipment usually leads to errors. The equation for settling of dust particles or liquid drops in the active zone of the apparatus is given. It is separated into a vertical component and a component parallel to the axis of the apparatus. An equation is also given for the hydrodynamic drag coefficient of the medium. These equations are combined to make it possible to calculate the time of inertial motion of the particles and the inertial path. The inertial path in the active zone of the apparatus is fairly long for large particles. Equations are transformed for the sedimentation velocity of the particles. The original equation is that for the vertical component of particle motion. Various steps in the mathematical derivation are shown. The resulting equation is used to show that the acceleration path in which the particle assumes the established sedimentation velocity is very short. A formula for the established sedimentation velocity is obtained. Values of the constants in the equations are given for various Re values. Another equation is given for the optimal length of the apparatus in which particles of a specific size will settle. The formula for the efficiency of dust collection is also given. Efficiencies calculated by this method agree satisfactorily with experimental results.

56859 **APTIC NO. 81408**

Lock, J. E.

DUST AND FUME CONTROL SYSTEMS. *Processing, vol. 1975:59,61,63, Dec. 1975. 2 refs.*

The major air pollution problem is due to airborne dusts and fumes. Dust clouds tend to form when the velocity of fall of the particle equals the resistance of the air. The harmful effects of dust both in the environment and within factories have caused the development of a variety of dust and fume control systems for dealing with the pollution at its source. The commonly used forms of gas cleaning plant are the cyclone or inertial collector in which the particles are made to change direction sharply, the fabric filter, the liquid scrubber, and the electrostatic precipitator. For coarse particles, cyclones are the most economical way of separating dust from an air stream. The cyclone is used in normal practice for dusts down to about 10 micron alone or as a pretreatment stage in a control system. Cyclones can be made with efficiencies in the submicron range and diameters down to about 1 in. for very dangerous dusts. Where fine particles and free flowing dusts have to be removed, the fabric filter is often the most economical choice. Limiting factors for fabric filters include the acidity of materials, high temperatures, and situations where a hard cake can be built up. Economics tend to depend on the prevention of blinding and on long material life. The versatility of the fabric filter systems is such that the system can be selected according to variables such as the type of fumes, type of cleaning system, the size, surface area, and shape of the particles, their concentration, the temperature of the effluent, pressure drop limits and the required filter efficiency. The function of wet scrubbing systems is to wet the dust particles and thus increase their weight so that they become heavy enough to separate from the gas using a lower efficiency cyclone or some inertial technique. A fairly simple plant from the construction point of view, it has a comparatively low capital cost. Their efficiency depends on the wettability of the particles. Local exhaust ventilation systems are also discussed.

56860 **APTIC NO. 81128**

Locke, H. B. and H. G. Lunn

FLUIDISED BEDS. CLEAN HEAT AND POWER CYCLES USING FLUIDISED COMBUSTION. *Chem. Eng., no. 303:667-670, Nov. 1975. 6 refs.*

The advatanges of using fluidized bed combustion in the production of clean heat and power cycles is discussed. In fluidized combustion, high combustion efficiency and high rates of heat absorption are obtained at low combustion temperatures. The consequent advantages of this technique, when compared with conventional combustion plants, include reduction in boiler size and cost; reduced nitrogen oxides emission; effective sulfur dioxide removal with low capital and operating costs; the possibility of passing the combustion gases from low grade fossil fuels through gas turbines; and, particularly in the case of coal, reduction of the fuel preparation costs together with a widening of the range of solid fuels that can be fired with satisfactory results.

56861 **APTIC NO. 81474**

Lundsager, Christian Bent and Francis John Sergeys

PROCESS FOR PREPARING AN AUTO EXHAUST CATALYTIC CONVERTER. *(W. R. Grace and Co., New York) U. S. Pat. 3,904,551. 10p., Sept. 9, 1975. 1 ref. (Appl. Dec. 19, 1973, 4 claims).*

A highly versatile, efficient, lower-cost catalytic converter for internal combustion engine exhaust is described. It includes a porous ceramic monolithic support provided with through holes uniformly throughout a first portion of the support for passing the exhaust in contact with catalyst metal values deposited on walls defining the holes. The support is provided with a second portion wherein similar holes are free of deposited catalyst and are adapted to prevent passage of the exhaust. Other catalytic converters have limited commercial acceptance due to their limited versatility and high cost, particularly when palladium or platinum is included. (Author abstract modified)

56862 **APTIC NO. 81475**

Lyon, Richard K.

METHOD FOR THE REDUCTION OF THE CONCENTRATION OF NO IN COMBUSTION EFFLUENTS USING AMMONIA. *(Exxon Research and Engineering Co., Linden, N. J.) U. S. Pat 3,900,554. 7p., Aug. 19, 1975. 7 refs. (Appl. March 16, 1973, 34 claims).*

A method for the reduction of the concentration of nitric oxide in combustion effluents using ammonia is described. An effluent stream containing NO contamination is contacted with 0.5 to 1.5 mole of ammonia/mole of NO in the presence of 0.1 to 11 vol% oxygen, and at a temperature of 1700-1900 F to selectively reduce the NO. The use of ammonia is unique among NO reducing processes.

56863 **APTIC NO. 81242**

Mackinger, H.

ODOR ELIMINATION THROUGH THERMAL AFTERBURNING. THE INTEGRATED INTEGRAL-PLANT IN THE UPPER AUSTRIAN ANIMAL CARCASS UTILIZATION PLANT, REGAU. *(Geruchsbeseitigung durch thermische Nachverbrennung. Die integrierte Integral-Anlage in der ooe. Tierkoerperverwertungs-Ges.m.b.H., Regau). Text in German. Umweltschutz Staedtereinig. (Vienna), 1975(11):282, 1975.*

The integrated thermal afterburning unit of the Upper Austrian Animal Carcass Utilization Plant, Regau, is described. The malodorous air exhausted from different sections of the animal carcass processing plant is admitted into incinerator chambers, using dust-free air as secondary air. Complete combustion of the malodorous components is achieved at temperatures between 800 and 1150 C. The waste heat generated in the afterburning unit is utilized for steam generation. The afterburning unit is controlled from the central control room.

56864 **APTIC NO. 81476**

Mai, Gerhard, Reiner Siepmann, and Franz Kummer

CATALYST FOR THE REDUCTION OF NITRIC OXIDES. *(W. C. Heraeus GmbH, Hanau (Federal Republic of Germany)) U. S. Pat. 3,900,428. 5p., Aug. 19, 1975. 4 refs. (Appl. Sept. 7, 1973, 8 claims).*

A mixed metal oxide catalyst for the reduction of nitrogen oxides in automobile exhaust gases is described. The catalyst is highly active and selectively causes nitrogen, rather than ammonia to form as the reduction product of the NOx. The catalysts are substantially more active than other catalysts.

56865 **APTIC NO. 81541**

Mai, Gerhard, Reiner Siepmann, and Franz Kummer

OXIDATION CATALYST FOR COMBUSTIBLES IN GAS MIXTURES. *(Heraeus (W. C.) GmbH, Hanau (West Germany)) U. S. Pat. 3,901,828. 7p., Aug. 26, 1975. 5 refs. (Appl. Sept. 7, 1973, 11 claims).*

A catalyst for the oxidation of carbon monoxide and/or gaseous organic substances in exhaust gases from automobiles as well as from stationary sources is described which possesses high activity, retains this activity under operating conditions, and is highly insensitive to catalyst poisoning. The catalyst composition comprises the following: at least one trivalent cation of metals selected from the rare earth group; at least one divalent cation of strontium, barium, or lead; at least one divalent cation of nickel, cobalt, iron, zinc, copper, or manganese; at least one tetravalent cation of ruthenium, osmium, iridium, platinum, titanium, molybdenum, tungsten, niobium, manganese, or vanadium; and at least one pentavalent cation of tantalum, antimony, or niobium.

56866 **APTIC NO. 81597**

Mai, Gerhard and Reiner Siepmann

CATALYST FOR PURIFYING EXHAUST GASES. *(W. C. Heraeus GmbH, Hanau am Main (Federal Republic of Germany)) U. S. Pat, 3,905,918. 10p., Sept. 16, 1975. 4 refs. (Appl. March 28, 1974, 11 claims).*

A catalyst for the purification of exhaust gases containing nitrogen oxides and/or carbon monoxide and/or hydrocarbons was developed. The catalyst is effective at temperatures below 400 C and may be used as solid catalysts, or may be used in conjunction with a support material. The metallic component can cover a portion of the surface of the support or a portion of the surface of the component alone or on a support. Platinum or a mixture of Pt and palladium are especially suitable as elements in metallic form from the group of ruthenium, rhodium, Pd, iridium, and Pt. An atomic ratio of Pt to Pd of the order 1:1 is preferred.

56867 **APTIC NO. 81562**

Mamiya, F.

ENVIRONMENTAL POLLUTION CONTROL MEASURES AT THE PAINTING FACTORIES. *(Toso kojo ni okeru kogai boshi taisaku). Text in Japanese. Toso to Toryo (Finish Paint), no. 260:59-68, Oct. 1975.*

The organic solvent emission control regulations in the U. S., and the trend in control regulations in Japan are reviewed. Descriptions of environmental standards in the U. S. and Japan for sulfur dioxide, carbon monoxide, suspended particulates, nitrogen dioxide, and photochemical oxidant are given, with emission control standards for organic solvents, control regulations concerning vaporization of hydrocarbons, and the consumption quantity of solvents. Data on emission quantities by the type of emission source and the percentage contribution from each source, measured in Tokyo in 1972, are also given. Aspects of fire and explosion hazards of flammable organic solvents, and their toxic effects on humans are also discussed. A recovery system for organic solvents from exhaust gas, based on adsorption by activated carbon and developed by the Nippon Kakoki Co., is described.

56868 **APTIC NO. 81730**

Maness, Roy F., Raymond H. Moore, and Charles A. Rohrmann

CATALYTIC OXIDATION OF NITRIC OXIDE IN MOLTEN SALT. *(Battelle Memorial Inst., Richland, Wash.) U. S. Pat. 3,911,081. 4p., Oct. 7, 1975. 10 refs. (Appl. June 28, 1972, 13 claims).*

A fused salt catalytic oxidation process for economically reducing nitric oxide concentrations in waste gases is described. A gas stream containing oxygen and NO is contacted with a molten alkali-metal sulfate salt containing an oxide of vanadium. The resulting gaseous stream containing a higher oxide of nitrogen is then contacted with an absorbent to remove the nitrogen oxide from the gas. The absorbent is preferably an alkali-metal carbonate that is maintained in a molten state at a temperature of between 300 and 500 C and which reacts with the nitrogen oxide to form an alkali-metal nitrate. (Author abstract modified)

56869 **APTIC NO. 81167**

Manuell, R. W.

POLLUTION WITH SPECIAL CONSIDERATIONS FOR THE RUBBER INDUSTRY. *Aust. Plast. Rubber, 26(8):26-27, 29-31, Aug. 1975. 15 refs.*

Air Pollution control in the rubber industry in Australia is discussed. Rubber factories are scheduled premises under most Clean Air Acts and are legally obligated not to exceed certain limits for specified pollutants. Inefficient combustion causes the largest amount of air pollution. Too much excess air is the commonest single cause of inefficient combustion, and can be readily checked by stack gas analysis for oxygen and/or carbon dioxide. Sulfur dioxide can be controlled by increasing the stack height. Excessive boiler blowdowns, clogged air blowers, abnormal burners, or flame patterns cause dark smoke or particulate emissions, and are usually controlled by improved maintenance standards. Preventing emissions at the design state is the cheapest solution in the manufacturing section of the plant. All liquid products, particularly volatile materials, should be stored in underground tanks whenever possible, and fed to processes through meters. Incineration can convert odiferous vapors to harmless CO2 and water.

56870 **APTIC NO. 81400**

Marsee, Frederick J. and Robert M. Olree

EXHAUST REACTOR. *(Ethyl Corp., Richmond, Va.) U. S. Pat. 3,902,853. 7p., Sept. 2, 1975. 14 refs. (Appl. April 6, 1973, 18 claims).*

An exhaust converter for an internal combustion engine is described. The inner housing contains a flexible suspended catalyst container, dividing it into an inlet plenum and a thermal noncatalytic reactor compartment. Air injection means are provided in the thermal reactor. The catalytic stage reduces nitrogen oxides and the thermal reactor oxidizes hydrocarbons and carbon monoxide. The light flexible construction of the inner housing allows it to expand and contract in response to thermal shock without destroying itself. This eliminates a problem encountered with other converters. (Author abstract modified)

56871 **APTIC NO. 81068**

Martin, W. J. and H. Weiand

REFUSE INCINERATION WITH HEAT RECOVERY TYPICAL DESIGN AND PRACTICAL EXPERIENCE. *Josef Martin Feuerungsbau GmbH, Munich (West Germany), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 97-104. (Nov. 3-5.)*

The design and operation of refuse incinerators with heat recovery are described. Typical steam cycle schemes of refuse incinerator plants include: district heating stations; heat and power stations with back pressure turbines; power stations with condensing turbines; and heat and power stations with tap-off condensing turbines. The theoretically utilizable heat quantity of annual per capita refuse production is analyzed and compared to actual figures for four European communities.

56872 **APTIC NO. 81163**

Matsumoto, K. and K. Hasegawa

MAINTENANCE PERTAINING TO ENVIRONMENTAL POLLUTION CONTROLLING EQUIPMENT IN CASE OF FUJI SEITO CO., LTD. *(Kogai boshi sochi no mentenansu Fuji seito no keisu). Text in Japanese. Puranto Enjinia (Plant Eng.), 7(12):55-59, Dec. 1975.*

The maintenance of environmental pollution control equipment at the Fuji Sugar Manufacturing Co. (exhaust gas desulfurization) is discussed. In the Shimizu factory pollution is discharged at a rate of 23N cu m/hr of exhaust gas, 1000 cu m/day of waste water requiring treatment, and eight ton/day of solid wastes. The exhaust gas desulfurization equipment was installed at the Shimizu Factory in July 1974, utilizing the soda sulfate method to collect dust and soot contained in the exhaust gas in a circulating water tank. The performance of the equipment is excellent and yields more than a 90% removal rate for SOx. The maintenance work for this equipment involves inspection for corrosion and scaling every ten days (the equipment was remodeled for simpler disassembly); safety check lists, and investigation of the back-up system to be used in the event of mechanical failures.

56873 **APTIC NO. 81561**

Matsumura, Y.

ENERGY SAVING TECHNOLOGY ON THE HEAT TREATMENT FACILITIES AND LOW NOX HEAT CONTROL. *(Netsu setsubi no sho-energi gijutsu to tei NOx netsu kanri). Text in Japanese. Nihon Gasu Kyokai Shi (J. Japan Gas Assoc.), 28(9):65-83, Sept. 1975.*

City gas, with its high combustion efficiency and clean exhaust gas, has attracted a great deal of attention as an industrial energy source. Based on the operation record of new facilities and existing facilities converted to city gas, the effects of energy conservation and nitrogen oxides reduction are evaluated, in light of economic considerations. Data on NOx emission concentrations and the reduction rate achieved by the combination of fuel conversion to city gas and combustion modification (including two-stage combustion, low NOx burner, exhaust gas recirculation and steam injection) are compiled for boilers, metal melting furnaces, and coke ovens. The characteristics of each NOx control measure are discussed, with descriptions of individual combustors and the NOx control measures adopted for each.

56874 **APTIC NO. 81589**

Matthews, Charles C.

TURBINE ENGINE OIL SUMP EMISSION CONTROL. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,906,717. 4p., Sept. 23, 1975. 3 refs. (Appl. March 21, 1974, 2 claims).*

An emission control system for a vented lubricant sump in a gas turbine engine is described. In gas turbine engines, small gas leakage paths normally exist between high pressure air cavities in the system and lubrication galleries which eventually communicate with the lubricating oil sump of the engine. Such sumps, which contain unburnt hydrocarbons, are normally vented to the atmosphere to avoid buildup of pressure that might adversely effect distribution of lubricant to the bearing components of the engine. This system includes a provision for scavenging the unburned hydrocarbons in the vent conduit and consuming them by combustion while avoiding buildup of pressure in the lubricant distribution system.

CONTROL METHODS

56875 **APTIC NO. 81665**

Matumoto, Noboru, Takao Nonoyama, Tutomu Tomita, and Yukio Suzuki

EXHAUST GAS PURIFYING SYSTEM. *(Toyota Jidosha Kogyo Kabushiki, Kaisha (Japan)) U. S. Pat. 3,906,723. 9p., Sept. 23, 1975. 4 refs. (Appl. Aug. 23, 1974, 10 claims).*

An exhaust gas purifying system for use in an internal combustion is described. It includes an air switching device connected to an air cleaner and operated by negative pressure introduced from a suction pipe. The air switching device selectively supplies the air from the air cleaner to an exhaust manifold for oxidation of unburnt gas components or to a catalytic convertor for cooling catalyst, or otherwise returns the air to the air cleaner. The air switching device eliminates the need for the costly and complex computor found in other purification systems. (Author abstract modified)

56876 **APTIC NO. 81554**

McAndrew, Murray A.

VAPOR RECOVERY AND DISPOSAL SYSTEM. *(Shell Oil Co., Houston, Tex.) U. S. Pat 3,902,874. 6p., Sept. 2, 1975. 5 refs. (Appl. Dec. 13, 1973, 5 claims).*

A system for preventing gasoline vapors contained in air vented from gasoline storage tanks from entering the atmosphere during tank filling operations is described. The system includes a bed of solid adsorbent that is capable of adsorbing gasoline vapors from a mixture of gasoline vapors and air. The vapor-laden air passes through the bed before being vented to the atmosphere. When the adsorbent approaches saturation, it is backwashed with air, preferably heated, from a blower to remove enough gasoline to restore it to a regenerated condition. The gasoline removed from the adsorbent bed is combusted in an internal combustion engine. The same internal combustion engine can be used to drive the blower, and waste heat from the engine can be utilized to heat the air by passing it through a radiator associated with the engine. (Author abstract modified)

56877 **APTIC NO. 81731**

Mehl, Wolfgang and Kurt Halfar

AIR POLLUTION CONTROL. *(H. Dudley Wright, Geneva (Switzerland)) U. S. Pat. 3,911,080. 9p., Oct. 7, 1975. 5 refs. (Appl. Sept. 7, 1973, 14 claims).*

A method for the economical removal of a wide variety of pollutants from gas streams is described. The process involves contacting the polluted stream with a liquid impermeable module or cell having as a surface a liquid-impermeable and gas-permeable membrane and containing an agent which reacts with the pollutants to convert them to one or more innocuous substances. The membrane is preferably composed of an absorbent such as powdered activated carbon dispersed in an inert hydrophobic polymer like polytetrafluoroethylene. The reactive agent is preferably an aqueous solution of an oxidizing agent like hydrogen peroxide. An electrolytic cell in which the spent oxidizing agent is regenerated by electrolytic means can also be provided. (Author abstract modified)

56878 **APTIC NO. 78973**

Miki, Takao and Toshikazu Saida

INTRODUCTION OF ELECTRONICS TO THE EMISSION CONTROL. *(Haiki seigyo eno erekutoronikusu no donyu). Text in Japanese. Preprint, the Society of Automotive Engineers of Japan, Tokyo, p. 651-654, 1975. 6 refs. (Presented at the Society of Automotive Engineers of Japan, Lecture Meeting, Kyoto, Oct. 29-30, 1975.)*

An electronic emission control device was developed for a Mazda rotary engine by Toyo Industrial Co. The engine speed, accelerator operation, choke operation and water temperature are fed as input signals, processed according to preset conditions, and output signals are transmitted through relay or solenoid valves to an ignition timing control, secondary air injection control, fuel control, and intake negative pressure control for the achievement of optimum emission characteristics, driving performance, and fuel economy. For low cost mass production of the complex electronic device, the electric circuit was divided into each functional unit and later assembled. Adequate reliability and durability for use in automobiles were attained. Advantages and disadvantages of the system are discussed.

56879 **APTIC NO. 78616**

Miller, Kenneth J.

COAL-PYRITE FLOTATION: A MODIFIED TECHNIQUE USING CONCENTRATED SECOND-STAGE PULP (TECHNICAL PROGRESS REPORT). *Bureau of Mines, Pittsburgh, Pa., Coal Preparation and Analysis Group, Rept. 91, 12p., May 1975. 4 refs.*

The Bureau of Mines two stage flotation process for reducing the pyritic sulfur content of fine coal was modified to provide a more concentrated final clean coal slurry underflow which could be dewatered economically by filtration or centrifugation. This was accomplished by doing the first stage coal flotation step in the conventional manner with a slurry of about 8% solids, but running the second stage pyrite flotation step with undiluted coal froth concentration containing about 25% solids. The final clean coal underflow produced by the new technique contained between 26% and 30% solids; this pulp was sufficiently concentrated to be filtered industrially without further thickening. Sulfur removal was equal to that obtained using dilute second stage pulp. The results indicate that dilution of the first stage coal froth concentrate for second stage pyrite flotation is not essential. The use of concentrated second stage pulp results in lower reagent consumption and more efficient use of available flotation cell volume, in addition to improving the dewatering properties of the clean coal slurry. (Author abstract modified)

56880 **APTIC NO. 74739**

Miwa, Kazuto and Tadashi Nagai

OPERATIONAL METHOD OF RECYCLING ENGINE. *(Risaikuri kikan sochi ni okeru untenho). Text in Japanese. (Hitachi Shipbuilding and Engineering Co., Ltd. (Japan)) Japan. Sho 50-9930. 3p., April 17, 1975. (Appl. Aug. 21, 1972, 3 claims).*

The operational procedure for a recycling type internal combustion engine, gas turbine, or steam turbine engine, in which a mixture of oxygen and recycled exhaust gas was used in place of air for combustion is modified to facilitate engine operation at ignition. Prior to ignition, the compressed air is blown into the recycled exhaust gas before entering the mixer for the purpose of reducing the carbon dioxide concentration of exhaust gas. The recycled exhaust gas is released from a safety valve located at a position close to the mixer as the air is blown into the pipe for the purpose of replacing the exhaust gas with air during the ignition. The blowing of a small amount of compressed air is maintained for the purpose of reducing the CO2 concentration during the initial period of driving until a stable low load combustion state is reached with a sufficient temperature elevation of the intake gas. The detailed description of the system and its operational procedure is presented with the aid of a flow sheet.

56881 **APTIC NO. 77549**

Miyaki, Kiyoshi and Hiroshi Ogure

INTERNAL COMBUSTION ENGINES. *(Nainen kikan). Text in Japanese. (Honda Motor Co., Ltd., Tokyo (Japan)) Japan. Model Util. Sho 50-14012. 2p., April 30, 1975. (Appl. May 8, 1972, 1 claim).*

The combustion chamber in this invention is composed of a main chamber and a subsidiary chamber. A throughhole is present between these chambers. The ignition plug is installed in the subsidiary chamber. The combustion in the main chamber takes place by the ignition of the gas in the subsidiary chamber. The exhaust tube from the main combustion chamber is placed as near as possible to the subsidiary combustion chamber, the wall between the exhaust tube and the subsidiary chamber being made as thin as possible. The wall is also made convex against the exhaust tube. By this construction, the combustion heat in the main chamber is easily transferred to the subsidiary combustion chamber where the ignition of the concentrated fuel- gas mixture takes place. Then the dew drops of fuel easily evaporate from the ignition plug and wetting of the electrodes is avoided. The ignition of the gas in the main chamber is also promoted because of the smooth and efficient ignition in the subsidiary combustion chamber. Thus the formation and discharge of carbon monoxide and nitrogen oxide are suppressed.

56882 APTIC NO. 81569

Morita, Shigeru and Yasunobu Yamaoka

AN INTAKE DEVICE FOR INTERNAL COMBUSTION ENGINES. *(Nainen kikan no kyuki sochi). Text in Japanese. (Toyo Kogyo Co. (Japan)) Japan. Model Util. Sho 50-4893. 2p., Feb. 1975. (Appl. April 8, 1971, 1 claim).*

An intake device was designed to prevent engine afterburn which occurs after the ignition switch is turned off. A shutter valve normally held open by a spring is placed downstream of the throttle valve of the intake pipe. A condenser which is charged when the ignition switch is closed, is placed in the circuit of the ignition switch and solenoid relay and the relay contact of the circuit is connected to the ignition circuit. When the ignition switch is opened, the shutter valve is closed for a given period of time by the action of a spring actuated by the condenser discharge, and simultaneously the ignition circuit is actuated. The air-fuel mixture injected after turning off the ignition switch and leaked through the space around the shutter valve is ignited in the engine by the action of the ignition circuit also actuated by condenser discharge, thus preventing the emission of incomplete combustion products.

56883 APTIC NO. 78825

Mueller, Klaus

INFLUENCE OF ENGINE DESIGN AND FUEL QUALITY ON DIESEL EMISSIONS. II. FUEL QUALITY. *Preprint, World Petroleum Congress, Japanese Organizing Committee, 5p., 1975. 2 refs. (Presented at the World Petroleum Congress, 9th, Tokyo, Japan, May 11-16, 1975.)*

The influence of fuel quality on diesel emissions was investigated in four diesel engines with different combustion chamber designs. Increased fuel volatility improves smoke in the prechamber engine and one direct injection engine but has practically no influence on nitric oxide emissions. The diesel engine with prechamber achieves up to 60% lower NO emission than both of the direct injection engines and responds to a lesser degree to volatility in terms of smoke. Increased aromatic content worsens NO emission in all engines but the effect of increased aromatics content on smoke is not consistent, since smoke emissions are worsened in the prechamber engine and one direct injection engine and improved in the other direct injection engine. Down ratings of the diesel engines by 10% reduces smoke emissions by 30%. Thus, operating conditions completely overshadow fuel as an influence on smoke emissions. Polynuclear aromatic emissions from diesel engine passenger cars were generally lower than from gasoline fueled cars; from engines with swirl chamber design were about 50% less than from engines of pre-chamber design; and increased when injection timing was retarded.

56884 APTIC NO. 81466

Murphy, Harry C., Jr. and Harry C. Stauffer

PROCESS FOR HYDRODESULFURIZING AND HYDROTREATING LUBRICATING OILS FROM SULFUR-CONTAINING STOCK. *(Gulf Research and Development Co., Pittsburgh, Pa.) U. S. Pat. 3,915,841. 7p., Oct. 28, 1975. 4 refs. (Appl. April 12, 1974, 8 claims).*

A two-stage hydrogenation process is provided whereby a lubricating oil base stock containing at least 2.0 wt% sulfur is initially hydrodesulfurized in the presence of a catalyst composite containing a low concentration of metals under a substantially reduced hydrogen partial pressure. Generally, the operating conditions employed in the initial hydrogenation or hydrodesulfurization stage include a temperature in the range of about 600 to about 900 F, a pressure in the range of about 300 to about 2500 lb/sq in., and a space velocity in the range of about 0.1 to about 10 volumes of charge stock/volume of catalyst/hr. A hydrogen partial pressure in the range of 200 to 2000 lb/sq in. is maintained in the hydrodesulfurization zone. The substantially desulfurized lubricating oil base stock, containing from 0.15 to 1.0 wt% sulfur, is then hydrotreated in the presence of a catalyst composition containing a relatively high concentration of metals and under a substantially increased hydrogen partial pressure. (Author abstract modified)

56885 APTIC NO. 81735

Murphy, Harry C., Jr., Robert A. Plundo, Harry C. Stauffer, Herman Taylor, Jr., and Stephen J. Yanik

PROCESS FOR PRODUCING A LUBRICATING OIL FROM A RESIDUE FEED. *(Gulf Research and Development Co., Pittsburgh, Pa.) U. S. Pat. 3,907,667. 29p., Sept. 23, 1975. 13 refs. (Appl. Aug. 22, 1973, 6 claims).*

A multiple stage process for the catalytic hydrodesulfurization and hydrodemetallization of a residual petroleum oil boiling above the gasoline range is described which requires no distillation or solvent extraction step for the removal of asphaltenes. The process involves a series of hydrodesulfurization stages, each operating at a temperature of between 650 and 800 F. Each stage employs a catalyst composed of Group VI and Group VII metals on alumina. The temperature of each stage is increased with increasing catalyst age to compensate for catalyst activity aging loss, and a lower hydrogen pressure is maintained in the final stage than in the initial stage. A greater amount of metals and sulfur are removed from the feed oil in the initial stage than in the final stage. The hydrogen pressures in the final and initial stages are respectively 1300-1900 psi and 2300 psi. The catalyst in the final stage consists of a higher wt% of Group VI and Group VII metals than the catalyst in the initial stage so that the final stage of the pretreatment produces a substantially asphaltene-free hydrodesulfurized effluent.

56886 APTIC NO. 81104

Musil, L.

THE POSSIBILITIES AND ECONOMIC IMPORTANCE OF COUPLING HEAT AND POWER GENERATION FOR PUBLIC POWER SUPPLY, ESPECIALLY IN COUNTRIES WITH WATER POWER. *(Die Moeglichkeiten und die wirtschaftliche Bedeutung der Heizkraftkupplung in der oeffentlichen Elektrizitaetsversorgung, im besonderen in Wasserkraftlaendern). Text in German. VDI (Ver. Deut. Ingr.) Ber., vol. 236:213-221, 1975. 9 refs.*

Economic and technical aspects of the coupling of heat and power generation for public power supply in countries with a high percentage of water power, such as Austria and Switzerland, are discussed. In view of the fact that the potential of the Alpine rivers is lowest during the winter period when the demand on thermal energy is highest, combined heating and electricity-generating power plants should be used as auxiliary plants to eliminate the short supply during the winter period. Remote heating by means of such auxiliary combined power plants should be used primarily in densely populated urban areas, while electric space heating should be reserved for sparsely populated areas with individual heating. The combination of remote heating with electricity generation results in a considerable fuel economy and corresponding reduction of combustion-generated air pollutant emissions. It is possible to use helium-cooled high-temperature nuclear reactors with gas turbines for remote heating and electricity supply in an economic manner.

56887 **APTIC NO. 81639**

Mutty, Paul R.

FUEL TANK VENTING SYSTEM. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,907,153. 5p., Sept. 23, 1975. 13 refs. (Appl. Feb. 19, 1974. 4 claims).*

An improved, easily assembled fuel tank venting system is described. It consists of a carbon canister for absorbing vapors from the system and a closed refueling phase of operation were a filler pipe inlet is completely sealed during refueling so that all vapors are kept within the vehicle. Refueling proceeds with little or no pressure buildup in the fuel tank.

56888 **APTIC NO. 74740**

Nagai, Tadashi

EXHAUST COOLING SYSTEM IN THE RECYCLING ENGINE. *(Risaikuri kikan sochi ni okeru haiki reikyaku sisutemu). Text in Japanese. (Hitachi Shipbuilding and Engineering Co., Ltd. (Japan)) Japan. Pat. Sho 50-9929. 3p., April 17, 1975. 1 ref. (Appl. April 14, 1972, 1 claim).*

The exhaust gas cooling system for a recycling type internal combustion engine, gas turbine or steam turbine engine is described. A mixture consisting of oxygen and exhaust gas is used for combustion instead of air in the engine. In the closed cooling system of this engine, the exhaust gas is cooled by a direct spray of cold water, and the exhaust gas containing cooling water and water produced by combustion is led to an air-water separator. The water separated is collected in a water tank, cooled by the water cooling system located outside of the engine body, and returned to the water sprayer. The cooling water is also circulated for cooling other parts of the engine. The excessive amount of water due to the water produced by combustion is discharged from the drain trap into the engine chamber which is periodically drained. A part of the dehydrated exhaust gas is led into the mixer where it is mixed with O2 and led into the combustion chamber. The rest of the exhaust gas is led to a compressor and discharged.

56889 **APTIC NO. 74768**

Nakai, Y. and T. Yokogawa

COMPARISON OF THE WET AND DRY METHODS OF ELIMINATION OF ODOROUS GASES. *(Akushu gas jokyo ni tsuite no shisshiki-ho to kanshiki-ho no kento). Text in Japanese. Kemikaru Enjiniyaringu (Chem. Eng.), 20(5):373-382, May 1975.*

The classification of odorous substances; methods of deodorization (gas washing, chlorination, air-oxidation, soil oxidation, ion exchange, combustion, catalytic oxidation, adsorption, masking, and ozone oxidation); the removal of organic solvents by wet methods; the wet treatment of waste gases discharged from paint factories; and the dry removal of organic odorous gases are reviewed. The evaporation of solvents such as toluene and xylene from painting factories is a serious problem in environmental pollution because the solvents cause photochemical smog. Kanagawa Prefectural Industrial Station develped a new process for the treatment of solvent evaporation. According to this process, the gases are washed with acid to absorb amines and other alkaline substances. In a second process formaldehyde is mostly absorbed. Finally, alcohols are washed off. This process is especially useful for the treatment of gases discharged from melamine coating factories.

56890 **APTIC NO. 81559**

Niimi, Yoshifuru and Shoji Inenaga

ALLOY CATALYST FOR NO REDUCTION IN AUTOMOTIVE EXHAUST GAS. *(Jidosha haigasuchu no NO kangenyo gokin shokubai). Text in Japanese. Preprint, Chemical Society of Japan, Tokyo, p. 39, 1975. (Presented at the Japan Chemical Society, Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975.)*

Alloy catalysts were developed for the reduction of nitric oxide in automotive exhaust gas. An alloy consisting of nickel, copper, and cobalt (for impairing oxidation resistance) was coated on base metal of Inconel N 75 by spraying process, heat treated and cold rolled. The optimum composition range is Ni R : Cu 5-30 : CO 5-10%, and the thickness of catalyst layer is 5-6 micron. A catalyst with a layer consisting of Ni 70-Cu 20-Co 10% was prepared and tested with experimental gas consisting of 1600 ppm NO, 3% carbon monoxide, 200 ppm hydrocarbons, 12% of carbon dioxide, and 0, 0.5 or 2% oxygen and nitrogen the balance. The denitrification rate of NO was above 95% at 530 C with 0% O2 and at 650 C with 0.5% of O2. The oxidation rate of Co was 40-50% at 400 C and 90% at 600 C. The amount of ammonia produced was 2.5% at 650 C with 0% of O2 and considered to be negligible at temperatures above 650 C. After 50 hr of continuous use at 800 C, no deteriorations in catalyst such as the separation of catalyst layer were observed.

56891 **APTIC NO. 81596**

Nishino, Atsushi, Kazunori Sonetaka, Hiroshi Kumano, and Yoshinori Noguchi

CATALYST FOR PURIFYING EXHAUST GAS. *(Matsushita Electric Industrial Co., Ltd., Kadoma (Japan)) U. S. Pat. 3,905,917. 6p., Sept. 16, 1975. 5 refs. (Appl. July 20, 1973, 8 claims).*

A catalyst for purifying automobile exhaust gas containing carbon monoxide and/or hydrocarbons was developed. The catalyst has a good spalling resistance at high temperature (400 to 600 C). The catalyst consists of manganese oxide as the main catalytic component, calcium aluminate as a heat resistant binder, and a heat resistant aggregate. Conventional catalysts are prepared by impregnating carriers consisting mainly of alumina balls or glass fibers with a water soluble metal salt. Such carriers are expensive and difficult to impregnate. This catalyst eliminates these problems.

56892 **APTIC NO. 81349**

Ochs, H. J.

OPERATION AND MAINTENANCE OF DUST COLLECTORS. *(Betrieb und Wartung von Entstaubern). Text in German. Metall (Berlin), 29(10):1025-1027, Oct. 1975. 3 refs.*

General problems related to the operation and maintenance of dust separators are discussed. Proper and systematic maintenance is essential for the efficient operation of dust separators. The maintenance requirement and expenditure is a function of the number and type of the dust separators used in a given plant, and it is especially high when different types of separators have to be used. Dust separators should be checked for their efficiency either continuously or at regular intervals, and the difference between the maximum allowable emission and the actual dust concentration after the separator should be determined. Pressure difference, gas temperature, dew point, and relative humidity of the waste gas should be controlled. Special attention should be given to explosion hazards inside the dust separator and dust collecting bunkers. Explosive mixtures should be avoided, or inert gas or vapor should be added to prevent explosion.

56893 **APTIC NO. 81331**

Ogawa, Hiromasa and Hiroshi Sano

MANUFACTURING METHOD FOR ACTIVATED CARBON USED IN DESULFURIZATION, BY TREATMENT WITH CYANAMIDE DERIVATIVES. *(Shianamido yudotai shori ni yoru datsuryu-yo kasseitan no seizoho). Text in Japanese. (Head of Agency of Industrial Science and Technology (Japan)) Japan. Pat. Sho 50-21435. 2p., July 23, 1975. (Appl. Dec. 3, 1971, 1 claim).*

Coke with large surface area, or ordinary activated carbon, is soaked in aqueous solution (containing more than 2.5%) of cyanamide and/or dicyandiamide, and heated in the absence of air at 750-950 C for about 10 min, to produce carbon containing more than 2% nitrogen. Whenever necessary, air drying, reduced pressure drying, or heat drying are used after soaking, before the final heat treatment. Activated carbon manufactured with cyanamide derivatives contained more nitrogen than those treated with melamine and its adsorptive capacity for sulfur dioxide is greater. Nitrogen content and adsorptive capacity are not decreased by repeated desorption by washing with water. When gas containing 0.2% SO2 at 100 C was passed through treated activated carbon for 5 hr, 84% (added nitrogen content 3.6%) to 90% (added nitrogen content 5.2%) adsorption of SO2 (by weight) occurred. For untreated activated carbon, SO2 adsorption ranged from 47-68%.

56894 **APTIC NO. 81170**

Okabe, M.

PRESENT SITUATION OF STACK GAS DENITRIFICATION TECHNIQUE; MITSUI-TOATSU TYPE STACK GAS DENITRIFICATION PROCESSES. *(Haiendassho gijutsu no genjo ni tsuite; Mitsuitoatsu-shiki haien dassho purosesu). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(9):43, 1975. 4 refs.*

The flue gas denitrification processes of the Mitsui-Toatsu Chemical Co. are described. The processes are selective catalytic reduction methods using ammonia gas, and therefore present none of the problems of waste water treatment associated with the wet type denitrification processes. Several different catalysts are available for the treatment of clean flue gas or dirty flue gas, and also for the different flue gas temperatures and different sulfur oxides contents in the flue gases. In all processes, the thickness of the catalyst layer in the reactor is 200 to 500 mm, which allows flexibility in the size of the denitrification facility. Basic data were collected by constructing several pilot plants for the treatment of different types of flue gas and for flue gas capacities ranging from 1000 to 8000 N cu m/hr, sulfur dioxide contents up to 500 ppm, and flue gas temperatures from 240 to 400 C. In all cases, more than 90% denitrification efficiency was obtained. The initial construction cost is estimated to be 1 to 1.3 million dollars for the treatment facilities for clean flue gas and 1.3 to 2 million for dirty flue gas treatment at 50,000 N cu m/hr. The running cost is in the range of $2 to $4/kl fuel.

56895 **APTIC NO. 81702**

Piver, Warren T.

METHODS PROPOSED TO ACHIEVE AIR QUALITY STANDARDS FOR MOBILE SOURCES AND TECHNOLOGY SURVEILLANCE. *Environ. Health Perspect., vol. 10:9-14, April 1975. 7 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

The methods proposed to meet the 1975 standards of the Clean Air Act for mobile sources are alternative antiknocks, exhaust emission control devices, and alternative engine designs. Technology surveillance analysis is an attempt to anticipate potential public and environmental health problems from these methods, before they happen. Components of this analysis are exhaust emission characterization, environmental transport and transformation, levels of public and environmental exposure, and the influence of economics on the selection of alternative methods. An attempt is made to show trends as a result of the interaction of these different components. These trends cannot be interpreted explicitly. Such an analysis is necessary so that public and environmental health officials have the opportunity to act on potential problems before they become manifest. (Author abstract)

56896 **APTIC NO. 81486**

Pozniak, Donald J.

EXHAUST GAS RECIRCULATION SYSTEM WITH HIGH RATE VALVE. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,901,203. 11p., Aug. 26, 1975. 7 refs. (Appl. July 23, 1973, 3 claims).*

An exhaust gas recirculation system for internal combustion engines is described in which a valve regulates the flow of exhaust gas recirculation from the exhaust manifold to the intake manifold in accordance with vehicle load changes. The valve regulates the exhaust gas recirculation in inlet air flow so that this control of exhaust gas recirculation and the existing residual exhaust within the combustion chamber for different engine load combines to produce a total dilution equal to that dilution which will produce reduced nitrogen oxides emissions while maintaining engine performance as the engine load increases.

56897 **APTIC NO. 81662**

Prasse, Herbert F.

ANTI-EMISSIONS COMPRESSION PISTON RING. *(Ramsey Corp., St. Louis, Mo.) U. S. Pat. 3,901,131. 8p., Aug. 26, 1975. 11 refs. (Appl. May 21, 1973, 12 claims).*

An anti-emissions arrangement of the piston ring and piston of internal combustion engine cylinders is described. Emissions are eliminated by avoiding the condensation of burned fuel along the cylinder wall which is common in other piston ring and piston arrangements. An improved piston ring arrangement is provided in which a U-shaped cross section piston ring with axially spaced legs has a web section which spans the legs in engagement with the cylinder wall. The upper leg is so located with respect to the top or crown of the piston as to assure that expanding gases from behind the ring are directed toward the hotter center area of the piston head in the vicinity of the vertical axis of the piston. A lower leg of the ring is positioned in an axially narrow ring groove positioned adjacently below the top of the piston, an upper leg of the ring overlies the top of the piston.

56898 **APTIC NO. 81153**

Rasch, R.

ENVIRONMENTAL PROTECTION AND SOLID WASTE DISPOSAL. *(Umweltschutz und Abfallbeseitigung). Text in German. Energie (Munich), 27(9):234-236, Sept. 1975. 12 refs.*

Problems and possibilities of waste heat utilization and energy recovery from wastes are discussed with respect to the recent energy crisis. Waste heat generated in power plants should be utilized for space heating and technological processes, and individual space heating should be abandoned in favor of remote heating in view of the reduced specific air pollutant emissions. Anaerobic digestion for flue gas generation, pyrolysis, and incineration are available for energy recovery from wastes. Wastes incineration represents practically no environmental hazard as the flue gas emissions can be adequately controlled. Anaerobic digestion, in which a fuel gas with a calorific value of 5000-6000 kcal/cu m is generated, is expected to acquire increased importance in the future. Using sewage sludge and other degradable wastes, large-capacity digesting units will be able to supply gas for households and even for entire power plants.

56899 **APTIC NO. 81256**

Reissmann, H.

FLUE GAS CLEANING AND FLUE GAS SCRUBBING IN INCINERATION PLANTS. *(Rauchgasreinigung und Rauchgaswaesche bei Muellverbrennungsanlagen). Text in German. Preprint, VGB Technical Association of Large Power Plant Operators E.V., Essen, 12p., 1975. 6 refs. (Presented at the VGB Incineration Conference, Hagen and Stuttgart, West Germany, April 4 and 18, 1975.)*

Problems and possibilities of dust separation and gas scrubbing at municipal and special waste incinerator plants are described. Dry mechanical dust separators are unable to guarantee compliance with the new dust emission standard of 100 mg/N cu m. Therefore, they are used sometimes as a first stage before electrostatic precipitators which reach efficiencies of up to 98-99%. The flue gas temperature in the electrostatic precipitator should be between 250-280 C to prevent hot-temperature corrosion or temperature drops to below the dew point. The efficiency of precipitators is determined not only by the precipitating surface area but also by the spacing between the precipitating electrodes. Wet type dust separators can use an accelerating diaphragm immediately behind the incinerator if the flue gas volume is fairly constant. For fluctuating flue gas volumes, venturi scrubbers with adjustable flow cross-section as a function of the flue gas flow is most suitable. While the carbon monoxide emission can be abated by adequate process control, chlorine and fluorine emissions require flue gas scrubbing with sufficient contact time between the flue gases and the absorbent liquid. Sulfur dioxide, sulfur trioxide and carbon dioxide are also separated partially. Dry methods, i.e., the use of calcia, do not guarantee compliance with the emission standards (100 mg/N cu m for Cl, and 5 mg/N cu m for F).

56900 **APTIC NO. 73458**

Reynolds, Joseph P., Louis Theodore, Joseph Quinlan, and Anthony Mercando

A STUDY OF FINE PARTICLE COLLECTION IN ELECTROSTATIC PRECIPITATORS USING A NEW MODEL FOR CALCULATING COLLECTION EFFICIENCIES. *Preprint, Manhattan Coll., Bronx, N. Y., Depts. of Chemical and Electrical Engineering, 16p., 1975. 16 refs. (Presented at the Environmental and Science Conference, 5th Annual, Louisville, Ky., March 3-4, 1975.)*

The Theodore model for calculating collection efficiencies in electrostatic precipitators is used to study the effects of precipitator geometry and various operating conditions on fine particle collection. The model is based solely on physical principles and thus requires no a priori information from pilot plant or field testing. The model demonstrates that particles with diameters either greater than 0.5 micron or less than 0.07 micron can be readily imparted a charge, in the first case by ion bombardment and in the second by ion diffusion. Particles in the intermediate range appear to cause a considerable collection problem, and variations in operating conditions and precipitatory geometry are unlikely to affect this range. Satisfactory efficiencies for these particles can probably be achieved at the expense of larger precipitators and the use of stronger electric fields. The model s predictions correlate well with data obtained from observations, offering a realistic and economical approach to electrostatic precipitator design. (Author conclusions modified)

56901 **APTIC NO. 81700**

Rodes, C.

FEASIBILITY OF A SPINNING PARTICULATE FILTER FOR SOURCE EMMISSION ANALYSIS STREAMS. *ISA (Instr. Soc. Am.) Trans., 14(3):255-260, 1975. 3 refs. (Presented at the ISA International Instrumentation Automation Conference and Exhibit, New York, Oct. 28-31, 1974.)*

A new method for particulate removal from gases is described. It consists of a spinning a cylindrical filter to create a boundary layer which prevents particles from reaching the filter surface. The centrifugal force at the filter surface spins off agglomerated particles. Tests conducted in a power plant show that agglomeration of particles provides the mass required to reject the particles from the disks by centrifugal force. Best results are obtained from particles likely to agglomerate or larger particles that have a greater mass. There is a dramatic difference between 0 and 2500 rpm. (Author abstract modified)

56902 **APTIC NO. 81555**

Rollmann, Louis D. and John C. Zahner

PROCESS FOR THE PRODUCTION OF GASOLINE. *(Mobil Oil Corp., New York) U. S. Pat. 3,902,870. 3p., Sept. 2, 1975. 1 ref. (Appl. May 30, 1974, 4 claims).*

A method for reducing the reactive olefin content of gasoline and thus its pollution potential is described which does not result in the usual octane number lowering associated with conventional hydro-treating methods. The method involves etherifying the iso-olefin content with excess methanol followed by the addition of a small amount of water to extract the excess methanol remaining after the etherification. The water-methanol phase can be conventionally resolved and the fractions thereof recycled. (Author abstract modified)

56903 **APTIC NO. 81652**

Roth, Fred S.

FILTER. *(Monsanto Co., St. Louis, Mo.) U. S. Pat. 3,905,787. 4p., Sept. 16, 1975. 4 refs. (Appl. Dec. 23, 1974, 4 claims).*

A device for filtering particulate matter from a gaseous medium is described. It consists of a nonwoven fabric layer secured to the downstream surface of a filter layer and supporting the filter layer. The fabric has a plurality of intersecting slits forming flap valves through which a gaseous medium to be filtered may pass. The combined area of the flap valves forms 35 to 60% of the area of the nonwoven fabric and the nonwoven fabric has a weight within the range of 13 to 34 g/sq m.

56904 **APTIC NO. 81478**

Rudolph, Paul

REACTOR FOR GASIFYING COAL UNDER PRESSURE. *(Metallgesellschaft Aktiengesellschaft, Frankfurt am Main (Federal Republic of Germany)) U. S. Pat. 3,902,872. 4p., Sept. 2, 1975. 6 refs. (Appl. Sept. 10, 1974, 4 claims).*

A reactor for the continuous gasification of coal under superatmospheric pressures and elevated temperatures with oxygen and water vapor is described. The reactor is designed to avoid the disadvantages of other devices and to ensure that coal is applied to the uppermost layer of the coal bed in a uniform and troublefree manner. The coal is not plowed by the feed chute as is usual with known feeders. The leading wall slides over the surface of the coal bed and exerts a downward pressure so that compaction of the swelling coal is promoted.

56905 **APTIC NO. 81186**

Runge, W. and Helmut Schoenfeld

TECHNICAL AND SAFETY IMPROVEMENTS ON CONVEYOR BELTS. *(Technische und sicherheitliche Verbesserungen an Fleissfoerderanlagen). Text in German. Glueckauf (Essen), 111(10):477-482, May 1975.*

Technical and safety improvements on conveyor belts in mines in West Germany are described. Prevention of dust generation, and dry dust separation have been one of the major concerns of the improvements. Encapsulations on conveyor belts and gyratory breakers are designed so as to prevent the entrainment of dust-laden air by the mine air. Wherever encapsulation is insufficient, the dust-laden air is exhausted by fans and through bag filters with plastic fiber mats.

56906 **APTIC NO. 81590**

Rupe, Jack H.

SYSTEM FOR MINIMIZING INTERNAL COMBUSTION ENGINE POLLUTION EMISSION. *(California Inst. of Tech., Pasadena) U. S. Pat. 3,906,913. 12p., Sept. 23, 1975. 2 refs. (Appl. Aug. 10, 1973, 18 claims).*

A mixing device for an internal combustion engine is described which simultaneously atomizes liquid fuel, mixes the fuel with an optimal quantity of hydrogen, and combines this mixture with a prescribed quantity of air. A throttling mechanism controls the fuel delivery to the engine and also limits the fuel to air equivalence ratio to a predetermined upper bound to inhibit the production of air pollutants and to a lower bound which is above the lean flammability of the mixture. No other system can maintain a mixture of hydrogen-fuel and air within predetermined boundary limits over the engine operating range. (Author abstract modified)

56907 **APTIC NO. 81719**

Sakurada, Ariaki

COUNTERMEASURES AGAINST PETROCHEMICAL CONTAMINATION. *(Sekiyu kagaku ni yoru osen taisaku). Text in Japanese. Preprint, Japan Chemical Society Tokyo, p. 23-26, 1973. (Presented at the Japan Chemical Society Lecture Meeting on Petrochemical Industries, 6th, Fukuoka, Oct. 17-18, 1975, Paper 1A06.)*

Pollution countermeasures taken by petrochemical industries are described. Production capacity in terms of ethylene amounted to 4.81 million tons/yr in 1974. In 1974, $238 million were spent on pollution control measures, of which 51.0% were spent on air-related measures. A special group dealing with nitrogen oxides was established within the Association of Petrochemical Industries (38 member companies). Water pollution control measures include treatment of effluent in the form of coolant water (sea water; fresh water); or water used in manufacturing processes (cooling, washing). Coolant water is recycled, cleaned, and expelled. Effluent from manufacturing processes is purified by a primary treatment, and the active slurry is treated further. Photochemical wastes are mostly gases and liquids. Secondary products are utilized effectively, or recovered for reuse. The total amount of catalysts used by the petrochemical industries in a year amounted to 14,819 tons, of which metals (22 kinds) amounted to 2794 tons. Aluminum, antimony, iron, titanium, comprised the major portion of the total weight. Expensive metals (silver, palladium, platinum) are almost completely recovered and reused. In 1974, on a construction basis, investment in industrial waste treatment installations amounted to about $13 million. It is unavoidable that final product costs will increase, as pollution control regulations become more stringent, and equipment costs skyrocket.

56908 **APTIC NO. 81332**

Sano, Hiroshi

A METHOD OF SEPARATING AND CONCENTRATING SULFUR DIOXIDE BY POLYVINYL CHLORIDE DIAPHRAGM CONTAINING TRICRESYL PHOSPHATE. *(Torikurejiru fosufeto ganyu pori-enkabiniru kakumaku ni yoru aryusan gasu bunri noshuku ho). Text in Japanese. (Head of Agency of Industrial Science and Technology (Japan)) Japan. Pat. Sho 50-23677. 2p., Aug. 9, 1975. (Appl. March 17, 1971, 1 claim).*

Sulfur dioxide is separated from a gas mixture by passage through a selectively permeable membrane of polyvinyl chloride (PVC), containing 15-55% of tricresyl phosphate (TCP). Below 10% TCP, air and SO2 pass through the membrane at nearly the same rates, but a sudden increase in SO2 permeability occurs at TCP content above 15%. Above 40% TCP, softening and stickiness of the PVC membrane increases markedly, and permeation operations become difficult. However, addition of TCP, in the range of 15-40%, made the membrane twice as permeable to SO2, (selective permeability 15 (15% TCP)-308 (45% TCP)) as when dioctyl phthalate was used as the additive. Separation of air containing 0.1% SO2, by passage through a PVC tube (40% TCP; 80 micron wall thickness; 1 cm outside diameter; 2 m long; 10 ml/sec air passage rate) coiled in sodium hydroxide resulted in outlet air containing 0.002-0.004% SO2. Passage of gas mixture (33.3% SO2; 33.3% hydrogen; 33.4% nitrogen) through a flat PVC membrane (47.5% TCP; 60 micron thickness) supported on a filter, under reduced pressure on one side, resulted in gas composition of 95% SO2, 4% hydrogen, and 1% nitrogen. When a gas mixture (90% SO2, 10% nitrogen) was introduced into a cloth bag lined with PVC (40% TCP; 80 micron thickness), and forced outside by reduced pressure (0.1 atm), the resultant gas composition contained over 99.5% SO2 and below 0.5% nitrogen.

56909 **APTIC NO. 81333**

Sano, Hiroshi and Hiromasa Ogawa

MANUFACTURING METHOD FOR ACTIVATED CARBON USED IN DESULFURIZATION, BY TREATMENT WITH METHYLOLAMINOTRIAZINES. *(Mechiroruka aminotoriajin rui shori ni yoru datsuryu-yo kasseitan no seizoho). Text in Japanese. (Head of Agency of Industrial Science and Technology (Japan)) Japan. Pat. Sho 50-21436. 2p., July 23, 1975. (Appl Dec. 7, 1971, 1 claim).*

Coke with large surface area, or ordinary activated carbon, is treated with methylolaminotriazines, or their condensates in the initial stages, to form activated carbon with more than 2% nitrogen content. The aminotriazines (1 part), which are reacted with formaldehyde (2-8 parts) to form methylolaminotriazines, include melamine, acetoguanamine, benzoguanamine. Carbon material is thoroughly soaked in aqueous solutions of methylolaminotriazines, drained of water, dried, and heated at 750-850 C in the absence of air for about 10 min. The adsorptive capacity of treated activated carbon toward sulfur dioxide (SO2) is 1.2-2 times that of the original carbon. There is no increase in adsorptive capacity toward other substances. The nitrogen content and adsorptive capacity of the treated activated carbon remains unchanged with repeated desorption and washing with water. When air containing 0.2% SO2 was passed through treated activated carbon for 3 hr at 100 C, 72% (2.2% added nitrogen) to 83% (3.2% added nitrogen) adsorption of SO2 (by weight) occurred. For untreated activated carbon, SO2 adsorption was 48%.

56910 **APTIC NO. 81592**

Schweibold, Donald J. and David R. Bentley

TREATMENT OF GASEOUS EFFLUENT. *(Questor Corp., Toledo, Ohio) U. S. Pat. 3,908,365. 18p., Sept. 30, 1975. 16 refs. (Appl. April 13, 1972, 13 claims).*

A method for the treatment of noxious emissions from the incomplete combustion of hydrocarbon fuel is described. The process includes: oxidizing a portion of the total oxidizable components, lowering the oxides of nitrogen content in the effluent by chemical reduction at elevated temperatures, and further oxidizing the remaining oxidizable components in the effluent to an acceptable level. In the exhaust effluent of motor vehicles, carbon monoxide content is decreased by 98%, hydrocarbon content is decreased [illegible]9%, and nitric oxide content is decreased by 90%. No other methods provide a satisfactory solution meeting commercial acceptance and the standards for emission sought and desired by industry and government. (Author abstract modified)

56911 **APTIC NO. 81252**

Schwieger, Robert G.

SO2-REMOVAL SYSTEMS CAN WORK. *Power, 119(5):44, 46, May 1975.*

Over 100 systems to control emissions of sulfur oxides from power plant stacks are being planned, built, or operated. Only a wet limestone scrubbing process appeared capable of meeting criteria for proven industrial scale acceptability. Industrial scale acceptability means satisfactory operation on a 100 MW or larger unit for more than 1 yr. This system had SO2 removal efficiency over 90% and 91.5% availability. Individual items of equipment were not necessarily available 90% of the time. The boiler burns coal. The desulfurization system consists of two parallel gas cleaning trains, each with a flooded disc scrubber, a wetted film absorber, mist eliminators, and a reheater. Problems were mechanical, corrosion, scaling, and plugging. Mechanical problems generally were of the types normally encountered in shakedown operations. The bypass dampers allowing the boiler to operate in case of major scrubber failure, permitting a small amount of untreated flue gas to bypass the scrubber. A third mechanical problem involved position control of the flooded disc in the scrubber. Corrosion was a problem in the reheater, the wet breeching, and the demister. Plugging in parts of the scrubber system probably was the result of excessive scaling, caused either by settling of solids or by a high concentration of solids. Such systems undoubtedly will require much more maintenance than other equipment in general use by utilities.

56912 **APTIC NO. 81718**

Shimoji, Masaharu and Haruhiko Satou

FUEL INJECTION TYPE ROTARY PISTON ENGINE. *(Toyo Kogyo Co., Ltd., Hiroshima (Japan)) U. S. Pat. 3,905,337. 4p., Sept. 16, 1975. 4 refs. (Appl. July 15, 1974, 3 claims).*

A fuel injection type rotary piston engine was improved to obtain better atomization of fuel and substantially reduce air pollutants in the engine exhaust gas. The engine has side air intake ports in the side housings and one or more peripheral air intake ports in the rotor housing. The side air intake ports are closed during light load or low speed operation of the engine while the peripheral air intake ports are open. The peripheral ports have an effective passage area which is small in relation to that of the side ports. They also have a substantially smaller distance in the peripheral direction of the rotor housing than in the widthwise direction. (Author abstract modified)

56913 **APTIC NO. 81224**

Shinano, K. and H. Tanaka

SIMULTANEOUS REMOVAL METHOD OF DRY TYPE. *(Kanshiki doji jokyo ho). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(9):51, Sept. 1975.*

A dry method of simultaneous removal for sulfur oxides and nitrogen oxides from flue gases is described. The method uses a specially developed catalyst which absorbs SOx and also catalyzes the reduction reaction of NOx by ammonia gas. The catalytic activity decreases with reaction time because of the decreased activity site of the catalyst after the absorption of SOx. The initial activity can be recovered if the deteriorated catalyst is treated with a hot inert gas for one hour. After a 253 hour reaction time test, the denitrification efficiency decreased by 20% of the initial efficiency and the desulfurization efficiency decreased by 30%. The optimum reaction temperature for the simultaneous removal was 200 to 230 C, at which about 90% efficiency for both denitrification and desulfurization was obtainable, although higher desulfurization could be obtained at a lower temperature and higher denitrification could be obtained at a higher temperature. The SOx absorbing ability of the present system was 2 to 2.5 times higher than that of conventional activated carbon. The denitrification efficiency was not affected by the NOx concentration for the 100 to 300 ppm range. For a continuous cleaning of flue gases, a mobile catalyst bed method can be used, in which the catalyst is slowly moved and the flue gas is passed perpendicularly through the catalyst bed, and the used catalyst enters a regenerator. Using this method, the clogging of the catalyst bed by dirty flue gas can be minimized. Conventional desulfurization facilities employing activated carbon could be modified for simultaneous NOx and SOx removal by employing a flue gas heating facility, ammonia gas injection device, and the appropriate catalyst instead of activated carbon.

56914 **APTIC NO. 74980**

Shinmen, Sadao

A TREATING AGENT FOR HARMFUL SUBSTANCES IN AUTOMOBILE EXHAUST AND ITS MANUFACTURING METHOD. *(Jidosha haiki gasu no yugaibun shorizai narabi ni sono seizo hoho). Text in Japanese. (Nikken Chemicals Co., Ltd. (Japan)) Japan. Pat. Sho 50-10557. 2p., April 22, 1975. (Appl. Aug. 25, 1970, 2 claims).*

This invention relates to the manufacturing method for a treating agent for carbon monoxide, sulfur dioxide, and tetraethyl lead in automobile exhaust gas. Purified ochre (Chinese yellow) containing 30-35% silica, 35-50%, alumina, and more than 10% iron was mixed with 1-3% oxidation catalyst such as cupric oxide and nickel oxide and 0.5% anionic exchanger containing 0.5% purified aluminum hydroxide and amine-formaldehyde resin. The mixed powders were dried at 105 C and were granulated to particles 3 mm to 10 mm in size. A catalyst cylinder (12 cm by 40 cm) divided into 3 chambers was packed with 1.2 cu cm of the above treating agent in each chamber. Exhaust gas from a 1500 cc passenger car was treated with satisfactory results.

56915 **APTIC NO. 81646**

Spehrley, Charles W.

EXPANDING VALVES FOR ELECTROSTATIC PRECIPITATORS AND THE LIKE. *(Joy Mfg. Co., Pittsburgh, Pa.) U. S. Pat. 3,900,299. 8p., Aug. 19, 1975. 10 refs. (Appl. June 6, 1973, 9 claims).*

A flow control system for an electrostatic precipitator is described. It consists of a plurality of elongated inflatable fabric bags used as valves to stop gas flow to the precipitator or through selective portions of the precipitator when such bags are inflated. Flow stoppage allows rapping with the electric field turned off, with the result that electrostatic adhesive forces are removed so that the plates may be rapped cleaner. Thinner dust coatings on the plates due to cleaner rapping promote higher efficiency of the precipitator, especially in high resistivity dust conditions. Other methods require mechanical devices to reverse or stop flow, but these are not successful because heat, dust, and corrosion make it difficult to maintain a satisfactory operation.

56916 **APTIC NO. 81645**

St. Cyr, Lewis A. and Loren H. Young

PREVENTION OF AIR POLLUTION BY USING ACTIVATED ALUMINA SOLID ADSORBENT TO REMOVE PARTICULATES OF LESS THAN 0.5 MICRONS FROM FLUE GASES. *(Vulcan Materials Co., Birmingham, Ala.) U. S. Pat. 3,900,298. 6p., Aug. 19, 1975. 5 refs. (App. July 13, 1973, 2 claims).*

An air pollution control process for the prevention of white smoke in the atmosphere caused by finely divided metal halide solids is described. Particulates less than 05. micron in size are removed from flue gases by passing the flue gases into intimate contact with a solid adsorbent of activated alumina. The solid adsorbent is particularly useful in removing metal halide solids such as aluminum chloride, potassium chloride, sodium chloride, and aluminum fluoride of less than 0.1 micron in size from the gaseous effluent of aluminum processing operations which utilize a gaseous chlorine treatment of molten aluminum. Activated alumina has not been used in any other process because it is widely believed that solid adsorbents are ineffective in removing submicron particulates and that liquid adsorbents, such as caustic or alkaline solutions are needed. (Author abstract modified)

56917 **APTIC NO. 81159**

Steinmetz, Werner

INFLUENCE OF THE STROKE/BORE RATIO OF AUTOMOBILE DIESEL ENGINES WITH SPECIAL REGARD TO THE HYPERBOLOID COMBUSTION PROCESS. *(Der Einfluss des Hub/Bohrungs-Verhaeltnisses bei Fahrzeugdieselmotoren unter besonderer Beruecksichtigung des Hyperboloid-Verbrennungsverfahrens). Text in German. Wiss. Z. Tech. Univ. Dresden, 24(1):235-243, 1975. 16 refs.*

The effect of the stroke/bore ratio on the performance and emission parameters of a single-cylinder diesel engine with 120 mm bore diameter was studied. The stroke was varied between 100 and 155 mm. The stroke-bore ratio had practically no influence on the generally low carbon monoxide concentrations, while the nitrogen oxides concentrations decreased with decreasing stroke-bore ratio, dropping to below 1000 ppm at 11/12. With respect to the 1975 U. S. emission standard of 4 g/HP hr, the optimal stroke/bore ratio would be 0.96. Even though such a ratio would still be more economical than any other measure that could be taken to abate nitrogen oxides emissions, it is possible to achieve a slightly lower degree of emission reduction in a more economical way by hyperboloid combustion and steep jet arrangement. The findings indicate that there is no need for returning to short-stroke engines or to vortex chamber for the sake of emission abatement.

56918 **APTIC NO. 81544**

Stookey, Byron O.

ROTARY ENGINE. *(Assignee not given.) U. S. Pat. 3,902,465. 7p., Sept. 2, 1975. 6 refs. (Appl. Feb. 4, 1974, 1 claim).*

A rotary internal combustion engine which possesses increased efficiency and reduced exhaust emission levels in comparison with conventional reciprocating engines is described. The engine exhausts the burned combustion gase much later in the combustion cycle than conventional internal combustion engines. Its design consists of three main units in spaced parallel relation: a compression unit, the combustion unit, and the power unit. The compression unit compresses the fuel mixture drawn from the carburetor and delivers it through a sleeve to the combustion unit. The compressed fuel mixture is ignited in the combustion unit by a spark plug. After a slight time interval for flame propagation in the fuel mixture, the rapidly expanding gas is delivered through another sleeve to the power unit. The expanding gas in the power unit pushes against vane-type pistons projecting through the periphery of a rotor, causing the rotor, as well as the shaft on which the rotor is mounted, to revolve and deliver power for external use.

56919 **APTIC NO. 81175**

Sugano, K.

REPRESENTATIVE PERFORMANCE, CHARACTERISTICS AND MAINTENANCE OF AIR FILTERS. *(Ea firuta no daihyoteki seino tokusei to iji kanri). Text in Japanese. Kukichowa to Reito (Air Conditioning Refrig.), 15(7):91-95, July 1975. 8 refs.*

It is important to understand each characteristic of an air filter, in order to maintain its performance. Fundamental maintenance requirements of various types of air filters are described. Any irregularities during operation must be detected, whether they are signs of lowered performance on reduced life. Care must be taken to check relationships between pressure loss and time of operation. The volume of aerosol inside the room must be measured regularly. The volume of dust outdoors must be measured. Leak tests must be carried out on the spot regularly, in accordance with air quality standards of rooms. Records of maintenance checks and measurements must be filed for future reference, and a log book kept so that chronological changes can be traced, to help in early detection of problems. Filter units must be cleaned, renewed, and exchanged. In order to avoid leaking, air-tight attachments must be checked for sealing. Air filter casings must be cleaned and repainted, and rust scraped. The HEPA filter and casing must be sterilized.

56920 **APTIC NO. 81691**

Suzuki, S.

ON THE AIR-CLEANING SYSTEM OF THE HIGH-RISE BUILDING. *(Koso biru kucho setsubi no kukijokani tsuite). Text in Japanese. Kuki Chowa to Reito (Air Cond. Refrig.), 15(9):118-123, Sept. 1975. 7 refs.*

Air filters for high-rise buildings are described. A two-stage charge type electrostatic air filter has an ionization section which is charged with direct voltage at 10-12 KV and a dust collecting plate which is charged at 5-6 KV. Dusts collected on the collecting plates are removed by washing or by a filter which is placed behind the collecting plate. A plain air filter uses unwoven cloth, glass fiber, metal net, polyurethane foam, or filter paper, as the filter materials. An air filter can give a higher collecting efficiency than an electrostatic air filter with appropriate filtering materials. Fibers having diameter smaller than 1 micron are used in high performance air filters having a collecting efficiency of 80-99.97%. A combination of a filter for large particles and a filter for medium-size particles is also a very effective method for dust removal in high-rise buildings.

56921 **APTIC NO. 81487**

Szlaga, Emil, Jr.

CARBURETOR WITH FEEDBACK MEANS AND SYSTEM. *(Colt Industries Operating Corp., New York) U. S. Pat. 3,906,910. 12p., Sept. 23, 1975. 14 refs. (Appl. April 23, 1973, 25 claims).*

A carburetor type fuel metering device for an internal combustion engine is described. The carburetor is provided with an air bleed valve for varying the pressure at one side of the metering restriction. This changes the metering pressure differential across the metering restriction and consequently varies the fuel-air ratio of the combustion mixture discharged by the carburetor to reflect changes in engine operating parameters. (Author abstract modified)

56922 **APTIC NO. 81139**

Szpindler, G. a Donau and P. L. Waters

INVESTIGATION OF POTENTIAL FOR HEAT AND MATERIAL RECOVERY IN THE FLUIDIZED-BED INCINERATION OF COAL WASHERY REJECTS AND SOME OTHER INDUSTRIAL WASTES. *CSIRO Minerals Research Labs., North Ryde, Australia, Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 313-319. 1 ref. (Nov. 3-5.)*

The potential of the fluidized bed incineration of coal washery rejects for heat and materials recovery was investigated. The combustor burns the dry rejects (60 to 70% ash, air dried basis) satisfactorily at temperatures of 750 to 950 C at maximum ratings of up to 3.375 kW/sq m and fuel feed rates of up to 50 kg/hr. The bed temperature in the reactor is controlled by changing the air-fuel ratio (excess air), inserting water cooled tubes into the bed, or water injection. Fluidized bed combustion of slurry is unsatisfactory. Methods of controlling bed temperature, such as variations in air-fuel ratio, direct water quenching, and insertion of water-cooled tubes, and their effect on heat recovery are discussed. The properties of the burnt rejects and their potential uses are described.

56923 **APTIC NO. 81694**

Tamaki, Kiheiji, Yoshiaki Miura, Akira Okamoto, and Masaaki Nakamura

METHOD FOR DESULFURIZING A WASTE GAS. *(Nippon Steel Corp., Tokyo (Japan)) U. S. Pat. 3,906,079. 6p., Sept. 16, 1975. 3 refs. (Appl. July 11, 1973, 8 claims).*

A method for desulfurizing a waste gas is described in which a mineral containing a mineral of the calcium system and a slag which occurs in the iron foundry is utilized in the form of a suspension in water. A desulfurization reaction is effected by gas liquid contact of the waste gas and the slurry of the absorbing agent. The waste gas is allowed to pass at first through the acidic region of the reaction vessel and then sequentially through the neutral region or the alkaline region of the vessel. The desulfurization reaction and the reaction for producing gypsum are allowed to take place simultaneously in the acidic region. The sulfur oxide remaining in the waste gas is absorbed in the neutral or alkaline region for supplementing the desulfurization reactor. Unlike other systems, there is no need of a pH adjustment apparatus or an oxidizing tower.

56924 **APTIC NO. 81725**

Tanazawa, Yasushi, Mitsumasa Yamada, Kanji Ito, and Kenji Ishiguro

EMISSION GAS PURIFICATION DEVICE. *(Haikigasu jyoka sochi). Text in Japanese. (Nippon Denso Co., Ltd., Toyoda Chuo Kenkyusho, and Toyota Motor Co., Ltd.*

(Japan)) Japan. Pat. Sho 50-32892. 8p., Oct. 25, 1975. 1 ref. (Appl. Dec. 26, 1970, 1 claim).

An automotive emission gas purification device which provides a secondary fuel and air supply to the exhaust gas combustion chamber is described. Conventional manifold reactors, afterburners, and catalytic compactors only provide a secondary air supply and cannot accommodate a stabilized continuous combustion through various changes in the operational modes of the automobile. The new process divides the operational modes into four classes, and controls the supply of secondary air and fuel according to the requirements of each operational mode for the achievement of optimum performance and economy of the purification device. The main features of the purification device are: an inlet manifold, an exhaust manifold, electromagnetic valves for control of the secondary air supply and secondary fuel supply, a secondary fuel ignition system, a temperature detector installed in the combustion chamber, a vacuum pressure gage installed at the air inlet manifold, and a speedometer installed at an axle shaft.

56925 **APTIC NO. 78250**

Tashiro, M. and K. Tsujimura

EMISSION CONTROL OF DIESEL ENGINE VEHICLES. *(Dizeru enjin sha no haiki gasu taisaku). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 29(8):796-805, Aug. 1975. 20 refs.*

Diesel exhaust emission control methods are reviewed with a description of causes for nitrogen oxides, hydrocarbons, carbon monoxide, black smoke, white smoke, and sulfur oxides emissions. The emission concentration of nitrogen dioxide is much lower than of nitric oxide, and therefore NO control is of primary concern. Control measures for NO include lowering the combustion temperature (timed fuel injection, water injection, emulsion fuel of water and light oil, intercooling, reduction of the compression ratio, and lowering of the cooling water temperature), reducing the oxygen concentration (exhaust gas recirculation), and reducing the O_2 concentration in the high combustion temperature region and lowering the combustion temperature in regions of high O_2 concentration. Hydrocarbon emission control measures such as elevation of compression temperature, temperature elevation of the combustion chamber wall, timed fuel injection modification of the injection system, reduction in fuel adsorbed on the combustion chamber wall, catalytic oxidation, and fuel control. As for CO, the improvement in intake efficiency and engine modification (injection system and combustion chamber) are discussed. For black smoke control, the PT injection system, and the use of smoke control additives (containing barium) are reviewed. For the control of white smoke, the elevation of compression temperature by means of increased compression ratio, elevation of intake temperature, and temperature elevation of the combustion chamber wall using an exhaust shutter, plunger cut, and electromagnetic valve cut is discussed. Odor and SO_x emission control measures are also reviewed.

56926 **APTIC NO. 81549**

Teague, D. Maxwell, Leo B. Clougherty, and Anthony N. Speca

OPERATION OF PLATINUM-PALLADIUM CATALYSTS WITH LEADED GASOLINE. *Environ. Health Perspect., vol. 10:113-116, April 1975. 15 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

The effect of various fuel additives on the ability of noble metal catalytic converters to remove the carbon monoxide and hydrocarbon components of automotive exhaust was examined via engine dynamometer tests. The test consisted of an initial 10 hr running on fuel containing no added lead antiknock, followed by 10 hr of operation on the same fuel containing the additive in question. A final 10 hour of operation, again on unleaded fuel, measured the extent of permanent deterioration. When standard leaded gasoline was used as the modified fuel, there was an abrupt loss in catalytic CO removal, from 95% to 30%. A subsequent 10 hr of operation on unleaded fuel showed a fairly rapid recovery of catalytic activity, back to 88% removal. When fuel containing no lead, but only a mixed ethylene dichloride and ethylene dibromide scavenger was burned, the catalyst showed an even more severe inactivation. The recovery of catalyst activity on pure unleaded gasoline was prompt and nearly complete. When leaded fuel was used with no scavenger, there was only a small loss in activity. A leaded fuel containing only ethylene dichloride scavenger exhibited little loss in activity. A small permanent loss was encountered with both fuels. These results suggest that catalysts may be successfully used in conjunction with fuels of relatively high tetraethyl lead concentrations, provided the ethylene dibromide portion of the scavenger is excluded. (Author abstract modified)

56927 **APTIC NO. 81655**

Tomb, T. F. and L. D. Raymond

FIFTH INTERNATIONAL LABOR ORGANIZATION REPORT ON THE PREVENTION AND SUPPRESSION OF DUST IN MINING, TUNNELING, AND QUARRYING IN THE UNITED STATES. *Mining Enforcement and Safety Administration, Pittsburgh, Pa., Pittsburgh Technical Support Center, Rept. 1027, 51p., 1975. 206 refs.*

Dust control practices for mining, tunneling, and quarrying in the United States from 1968 through 1972 are reviewed. Minerals worked include coal, metals, stone, sand, and gravel. Environmental exposure data for coal and asbestos mines and slate quarries are presented. Coal worker pneumoconiosis statistics; administration of Federal laws governing miners health and safety; research conducted by governmental and nongovernmental agencies; and techniques for dust sampling, measurement, and analysis are also included. (Author abstract modified)

56928 **APTIC NO. 81716**

Triebel, W.

PROBLEMS IN THE SHIPMENT OF REFINERY PRODUCTS. *(Probleme bei der Verladung von Raffinerieprodukten). Text in German. Gesundh- Ingr., 96(10):288-289, 1975. (Presented at the 3rd Symposium on Branch Specific Emissions by Oil Refineries and Petrochemical Plants. Bayerisches Landesamt fuer Umweltschutz, Munich, Federal Republic of Germany, March 20-21, 1975.)*

Systems developed by Emco Wheaton GmbH for the filling of tank trucks with mineral oil products are described. The gas displayed by the mineral oil in the tank during filling is collected in a closed system for the recovery of the hydrocarbons.

56929 **APTIC NO. 74965**

Tsutsumi, Shigeru

THE ROLE OF THE CATALYST IN POLLUTION CONTROL MEASURES. *(Kogai taisaku ni okeru shokubai no yakuwari). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 49(1):22-29, Jan. 1975. 7 refs.*

The closed system of the chemical industry, air pollution and the use of catalysts, recovery of plastic waste, tire waste and oil waste, desulfurization of heavy oil, carbon trouble and alkali catalysts, and the recovery of carbon dioxide are reviewed. A combination of the aqueous process and the desulfurization of exhaust smoke, the production of an electric spark by the addition of water to solid sodium hydroxide with irradiation by microwave, and a proposal for a microwave-steam process for the decomposition of tire waste without crushing, and an industrial recovery process for CO_2 and its application are also discussed.

56930 **APTIC NO. 81641**

Urban, Peter

CONTINUOUS PROCESS FOR SCRUBBING SO2 FROM A GAS STREAM AND MAKING SULFUR. *(Universal Oil Products Co., Des Plaines, Ill.) U. S. Pat. 3,904,743. 13p., Sept. 9, 1975. 2 refs. (Appl. June 18, 1973, 19 claims).*

A novel continuous process for scrubbing sulfur dioxide from a gas stream and producing elemental sulfur is described. The process involves using a conventional SO2 scrubbing procedure coupled with a regeneration procedure whereby thiosulfate is used as an intermediate in a multistep operation designed to convert the sulfite compound contained in the rich absorbent stream to elemental S, rather than an attempt to directly reduce the sulfite compound to S or sulfide in a single step operation. This sulfite to thiosulfate to polysulfide to S route provides s regeneration procedure which facilitates careful control of by-product formation during the regeneration operation and enables the production of a regenerated absorbent stream which can be directly recycled to the scrubbing step, thereby allowing the system to be operated in the closed loop fashion with respect to the absorbent stream. The use of thiosulfate rather than solid sodium hydroxide or sodium carbonate eliminates the buildup of sulfate common in other systems.

56931 **APTIC NO. 81121**

Virkar, P. D. and M. M. Sharma

MASS TRANSFER IN VENTURI SCRUBBERS. *Can. J. Chem. Eng., 53(5):512-516, Oct. 1975. 11 refs.*

The hydrodynamic and mass transfer characteristics of venturi scrubbers for the Wet-Approach (W-A) mode of operation over a wide range of operating variables was investigated. The theory of gas absorption with chemical reaction was used to obtain values of effective interfacial area, (a) liquid side mass transfer coefficient, (kLa), and gas side mass transfer coefficient, (kGa). The W-A mode of operation gave reasonably high values of a, KLa, and KgA at relatively low values of pressure drop. The effective interfacial area for the W-A mode of operation was independent of the viscosity of the liquid phase in the range of variables studied. A decrease in the surface tension of the liquid phase resulted in an increase in the values of effective interfacial area for the Pease-Anthony (P-A) mode of operation. The P-A mode of operation gave values of Kga which are substantially higher than those obtained for the W-A mode of operation. The pressure drop for the P-A mode of operation was significantly higher than that for the W-A mode. (Author conclusions modified)

56932 **APTIC NO. 81460**

Wahl, Josef and Peter-Jurgen Schmidt

FUEL-AIR MIXTURE PROPORTIONING CONTROL SYSTEM FOR INTERNAL COMBUSTION ENGINES. *(Robert Bosch G.m.b.H., Gerlingen-Schillerhohe (West Germany)) U. S. Pat. 3,900,012. 9p., Aug. 19, 1975. 4 refs. (Appl. Feb. 21, 1974, 11 claims).*

An air-fuel mixture proportioning device for internal combustion engines is described that reduces noxious exhaust emissions and, unlike prior art designs, is responsive to engine speed. The composition of the exhaust gas is electrically sensed, providing a signal to an integrating controller which is connected to adjust the air-fuel ratio. A switching circuit is connected to the integral controller to permit integration rate changes in response to engine speed changes. (Author abstract modified)

56933 **APTIC NO. 81673**

Wakamiya, Masayuki, Yoshiharu Maezawa, Jyun Yagi, Harutoki Nakamura, and Timinaga Yoshii

AUTOMOBILE EMISSION GAS PURIFICATION BY CATALYST OF SILICA CLOTH SUPPORT. (PART. 6). *(Shirika kurosu o tantai to suru shokubai ni yoru jidosha haigasu jyoka. (Dai 6)). Text in Japanese. Preprint, Catalysis Society of Japan, Tokyo p. 98-99, 1975. 3 refs. (Presented at the Japan Society Catalysis Lecture Meeting, 27th, Fukuoka, Oct. 19-20, 1975.)*

The heat in automotive emission control systems is considered to be one of the biggest factors in deterioration of catalytic activity. Using platinum on a silica cloth catalyst, the effect of heat on the surface area reduction of Pt and its effect on the oxidation reactions of hydrocarbons and carbon monoxide were investigated. The surface area was measured at 600, 700 and 850 C by the titration method, based on the amount of hydrogen up-take. The reduction in specific surface area at 850 C after 50 hr of heat treatment in the atmosphere was about 25%, and its effect on the reduction of Pt surface area was considered to be negligible. In the case of heat treatment at 600, 700 and 850 C, the Pt surface area was reduced markedly with temperature elevation, while the specific surface area remained almost constant. Therefore, the heat deterioration of the catalyst was considered to be due primarily to the reduction in Pt surface area. The effect of heat deteriorated catalyst on CO and HC oxidation reactions within a 10% conversion rate indicated that the conversion rate was proportional to the Pt surface area only qualitatively. The reduction in Pt surface area was found to be the main factor of heat deterioration; however, other factors were also involved.

56934 **APTIC NO. 81236**

Watanabe, Shoji

OBSERVATIONS ON CLOSED SYSTEMIZATION IN PETROLEUM-RELATED INDUSTRIES. *(Sekiyu kanren sangyo ni okeru kurozudu sisutemuka no kosatsu). Text in Japanese. Kagaku To Kogyo (Tokyo) (Chem. Chem. Ind.), 49(10):410-414, Oct. 1975.*

Realities and possibilities in introduction of closed systems to reduce air pollution are discussed. An ideal system, described in a research report on closed systemization in petroleum refining for MITI, is described. The installation has a capacity of 500,000 BPSD, and uses 90% Middle East oil, and 10% Indonesian oil (low sulfur). Utilizing heavy oil (sulfur content below 0.3%), unleaded gasoline with octane values of 98 and 88 (aromatics below 40%, olefins below 10%) are manufactured. Noise levels at the plant boundaries are below 50 phons; waste treatemnt has no adverse effects on the surroundings. Comprehensive monitoring systems are established. Water quality standards are: oil, 30 kg/day, less than 1 ppm; COD (chemical oxygen demand), 300 kg/day, less than 10 ppm; pH 6.0-8.0; SS (suspended solids), 150 kg/day, less than 5 ppm. The air standards are: sulfur oxides, 350 N cu m/hr (stack height 200 m); maximum hourly ground level concentration, 0.0017 ppm (hourly environmental standard, 0.1 ppm); nitrogen oxides, 490 N cu m/hr; maximum hourly ground level concentration, 0.0023 ppm (environmental standard 0.02 ppm, daily average of hourly values); dust, 134 kg/hr, less than 0.04 g/N cu m. Hydrocarbons and malodors are to have no adverse effects on the surroundings. In a recent Soviet magazine, Pervomaysk Chemical Complex in the Ukraine, near Kharkov, is described as a model closed system. Wastes are buried in the ground deeply enough not to appear for 5500 years. Currently, the complex takes in 4500 cu m/day of water from the North Donets River, and emits very little effluent.

56935 **APTIC NO. 81733**

Whitman, Robert Henry and Louis Leonard Lento, Jr.

CATALYST FOR ELIMINATION OF POLLUTANTS IN AUTO-EXHAUST GAS. *(American Cyanamid Co., Stamford, Conn.) U. S. Pat. 3,907,964. 6p., Sept. 23, 1975. 3 refs. (Appl. Jan. 25, 1974, 7 claims).*

A catalyst for the oxidation of hydrocarbons and carbon monoxide in automotive exhaust gases is described which offers increased oxidation efficiency and faster warm-up. The catalyst composition consists of a support material, preferably a calcined alumina extrudate, on which is deposited 1.5-10% (oxide weight) of an alkaline earth metal, 1-12% (oxide weight) of copper, and 0.5-40% (oxide weight) of chromium. The weights are based on the weight of the support material so as to provide a catalyst composition which effects about 50% CO conversion at a temperature of about 550 F and about 50% hydrocarbon conversion at 650 F. The catalyst exhibits a shrinkage of about 14% or less.

56936 **APTIC NO. 81649**

Winter, Karl and Gunter Staschik

METHOD OF PURIFYING AN AIR OR GAS FLOW OF VAPOROUS OR GASEOUS IMPURITIES ADSORBABLE IN FILTERS. *(Ceag Dominit Aktiengesellschaft, Dortmund (Federal Republic of Germany)) U. S. Pat. 3,905,783. 5p., Sept. 16, 1975. 5 refs. (Appl. June 22, 1973, 5 claims).*

A method of purifying an air or gas current of combustible vaporous or gaseous impurities adsorbable in filters is described. The method is based upon desorption, with the aid of inert gas, of a stoichiometric or substoichiometric combustion of coal, coke, liquid or gaseous hydrocarbons, city gas, coking plant gas, blast furnace gas, or carbonic gas. Cooling for the condensation of the desorbate involves only a minimum expenditure because the desorbed substances are relatively free of water, or the combustion gases can be dried at very low cost. The particular advantage of such a combination of inert gas desorption with subsequent cooling of the desorbate is derived from the double conservation of energy. In other systems the desorbate mixes with the water and requires an additional expenditure to separate it.

56937 **APTIC NO. 81542**

Wolk, Ronald H., Govanon Nongbri, and William C. Rovesti

MULTI-ZONE METHOD FOR DEMETALLIZING AND DESULFURIZING CRUDE OIL OR ATMOSPHERIC RESIDUAL OIL. *(Hydrocarbon Research, Inc., New York) U. S. Pat. 3,901,792. 5p., Aug. 26, 1975. 7 refs. (Appl. June 24, 1974, 4 claims).*

A multi-zone hydrodesulfurization process for the removal of sulfur as well as metals from residual oils is described that results in extremely long catalyst life in comparison with prior art processes. The extended catalyst life is obtained by removing most of the metals in a first stage having a contact material such as Porocel with extensive macroporosity so that less than 20 ppm of metals like vanadium reach the second stage which achieves a catalytic desulfurization of 75% or more. The first stage possesses a porosity of more than 0.15 cc/g (pore volume), whereas the catalyst in the second stage possesses little macroporosity (no more than 0.10 cc/g). (Author abstract modified)

56938 **APTIC NO. 81668**

Wood, Robert David

COMBUSTION APPARATUS FOR GAS TURBINE ENGINES. *(Rolls-Royce (1971) Ltd., London (England)) U. S. Pat 3,906,718. 9p., Sept. 23, 1975. 3 refs. (Appl. Sept. 4, 1973, 2 claims).*

A combustion apparatus for gas turbine engines in which the fuel supplied to a combustion chamber of the engine is discharged for combustion within the chamber is described. Staged combustion is provided to improve combustion efficiency, particularly in aircraft gas turbine engines at ground idling speed, and to reduce smoke emission, particularly at take-off. The chamber has staged combustion in two toroidal vortices of opposite hand arranged one upstream of the other. A burner delivers air/fuel mixture in a radial direction to support the vortices and the burner has a convergent outlet for the air/fuel mixture. The apparatus overcomes the problems associated with staged combustion so as to give complete mixing of the fuel and air in the tube and to cause the mixture to be discharged in a direction substantially radially of the axis of the burner. The double vortex combustion arrangement has considerably stability over the whole range of engine operating conditions. (Author abstract modified)

56939 **APTIC NO. 81664**

Yoshizaki, Masaaki

AIR CLEANER ASSEMBLY FOR AN INTERNAL COMBUSTION ENGINE HAVING AN EXHAUST GAS PURIFICATION SYSTEM. *(Toyota Jidosha Kogyo Kabushiki, Kaisha (Japan)) U. S. Pat. 3,906,724. 7p., Sept. 23, 1975. 6 refs. (Appl. July 11, 1974, 7 claims).*

An air cleaner assembly for an internal combustion engine having an exhaust gas purification system is described. A casing of the assembly has its interior divided into an atmospheric air section and a clean air section with a filter in-between. The clean air section is divided into a first compartment communicating with a carburetor of the engine and a second compartment communicating with the exhaust gas purifier. This apparatus overcomes the problems associated with a single chamber air cleaner, and eliminates the need for two air cleaners. (Author abstract modified)

56940 **APTIC NO. 81464**

Zimmerman, Abraham A.

METHOD OF REMOVING ORGANOMETALLIC COMPOUNDS FROM LIQUID HYDROCARBONS. *(Exxon Research and Engineering Co., Linden, N. J.) U. S. Pat. 3,915,849. 7p., Oct. 28, 1975. 6 refs. (Appl. Oct. 10, 1973, 8 claims).*

Organo lead compounds are separated from liquid hydrocarbons at a relatively high rate without increasing the gum content of the liquid hydrocarbons. The liquid hydrocarbon is contacted with an activated charcoal impregnated with hydrous ferric chloride. It is essential that the activated carbon be substantially amorphous. The contacting may be accomplished at any combination of temperature and pressure at which the hydrocarbon will remain liquid and at which all components used in the process will remain stable. The contacting may be accomplished in essentially any suitable fashion; however, contacting in a fixed bed of the activated charcoal is, generally, most convenient and effective. Impregnation of the activated charcoal is accomplished by contacting a suitable activated charcoal with an aqueous solution of hydrous ferric chloride and at least partially drying the resulting mixture such that the water remaining is internally adsorbed in the activated charcoal pores. Generally, the presence of water in the impregnated activated carbon adsorbent will improve separation performance. This method of separation is particularly suited to the separation of organo lead compounds from gasoline. (Author abstract modified)

56941 **APTIC NO. 81479**

Zoch, Robert M., Jr.

FUEL ADDITIVE AND METHOD FOR IMPROVING COMBUSTION. *(Enercon Corp. International) U. S. Pat. 3,902,868. 3p., Sept. 2, 1975. 7 refs. (Appl. Nov. 6, 1972, 3 claims).*

A new and improved gasoline additive which is added as a vapor in the air/fuel mixing chamber of an internal combustion engine is described. The fuel additive includes an alcohol and water and other selective additives, all of which are vaporizable in a blend for vapor phase addition to the engine fuel intake system. This additive is superior to other additives in obtaining improved combustion efficiency and reduced gaseous pollutant emissions and volatility. The additive is added in a concentration of from 0.2 to 1.2 vol% of the fuel, which amount is significantly small as compared to the amount of fuel. (Author summary modified)

56942 **APTIC NO. 72093**

NEW LIGHT SHED ON CHEMISTRY OF SCRUBBERS. *Chem. Eng. News, no. 1975:25-26, Feb. 17, 1975.*

Research into the chemistry of stack gas scrubbers is reviewed in terms of findings related to the reduction of gypsum scaling.

Lime/limestone scrubbers appear capable of operating with the scrubbing liquor unsaturated with respect to dissolved gypsum dihydrate, thus allowing for reduced gypsum scaling and increased amounts of clarified liquor available for mist eliminator washing. Unsaturated operation can be achieved easier with lime scrubbers than with limestone scrubbers. Magnesium addition enhances unsaturated operation and does not hinder the scrubbing efficiency. A mechanism involving the presence of calcium sulfate in a homogeneous solid solution is proposed as an explanation for unsaturated scrubber operation.

56943

APTIC NO. 74570

S.I.C.A. - A NEW METHOD OF POLLUTION CONTROL. *(S.I.C.A. nouvelle etape dans la depollution). Text in French. Papier, Carton Cellulose, 1975:56-59, Jan.-Feb. 1975.*

Environmental protection measures introduced recently at the Alizay pulp and paper plant are described. Malodorous emissions, caused primarily by mercaptans, are eliminated by condensing the malodorous vapors escaping from the blow tank. The non-condensable malodorous residues are incinerated in a special furnace. The waste gases emitted now are practically odorless.

56944

APTIC NO. 78847

AUTOMOBILE EXHAUSTS UNDER CONTROL? ELECTRONIC CALCULATION OF THE EXHAUST GAS EMISSION EASES REDUCTION. *(Autoabgase unter Kontrolle? Elektronische Berechnung der Abgasemissionen erleichtert Reduzierung). Text in German. Technische Umweltmag., no. 1:30-31, 1975.*

The possibility of controlling automotive exhaust-generated air pollution in inhabited areas by use of a computerized mathematical model is presented through the example of the TRASIM model developed by Dorsch Concult in West Germany. The model is based upon vehicle-specific and traffic-specific emission data, and upon statistical data on traffic. The model makes it possible to quantify the basic exhaust components, namely carbon monoxide, hydrocarbons, nitrogen oxides, and lead. The model can be used for the investigation of exhaust emissions in general traffic planning, for the evaluation of traffic modifications on the exhaust emissions, for the preparation of emission inventories in affected regions, and for the substantiation of traffic limitations. The mathematic-statistical model can also be used for smog alarms on the basis of known relationships between traffic parameters and other factors.

56945

APTIC NO. 81152

LENZING - A MODEL WITH REGARD TO ENVIRONMENTAL PROTECTION. *(Lenzing- vordbildlich im Umweltschutz). Text in German. Umweltschutz-Staedtereinig. (Vienna), 1975(11):278-280, 1975.*

Measures introduced at Lenzing Paper Company for air and water pollution abatement and waste recovery and recycling are described. The Lenzing magnesia process, using cheap calcined magnesite, makes it possible to recover 90% of the magnesia input and 80% of the sulfur input after the black liquor incinerator in the pulp-making process, which implies a considerable reduction of the sulfur dioxide emissions. Carbon disulfide, emitted in the viscose fiber production process, is recovered in a recovery unit.

56946

APTIC NO. 81157

CLEAN INCINERATION PLANT. *(Saubere Muellverbrennungsanlage). Text in German. Umschau Wiss. Tech., 75(18):580, 1975.*

A new experimental waste incinerator with 50 kg/hr capacity, designed by the Juelich Nuclear Research Center, West Germany, is described. The incinerator is composed of a combustion chamber with the combustion air admitted at its top, and a special afterburning chamber arranged below the former, in which a filter mat is arranged and into which afterburning air is admitted. The filter mat collects ashes in which the unburnt flue gas components are combusted at temperatures above 1000 C. The afterburning is catalyzed by the catalytic components of the ash. Suspended particles are filtered out by the ash-coated filter mat. The ash layer drops into the ash bed as soon as it reaches a certain thickness. The incinerator requires no separate flue gas cleaning device due to the use of the special afterburning chamber. When combined with an absolute filter unit, the incinerator is also suitable for the incineration of radioactive wastes.

56947

APTIC NO. 81432

Technische Kommission des VSO (Switzerland)

WASTE GAS FILTERS IN OIL-FIRED HEATERS, MODE OF OPERATION AND PROBLEMS. *(Abgasfilter bei Oelfeuerungen, Wirkungsweise und Probleme). Text in German. Gesundheitstech., vol. 8:172-174, 1975. 2 refs.*

Waste gas filters (mat filters), originally designed to retain iron oxides and iron sulfate and thereby to prevent soiling and corrosion of walls and roofs, are of no value environmentally because they can not eliminate the causes of the emissions. They are inefficient for soot, rust, and dust particles larger than 5 micron, as well as for aerosols and gaseous emissions. Rust emissions can be prevented by the use of corrosion-proof chamber lining, and the use of modern, soot-free burners practically eliminates the need for waste gas filters. Since mat filters are unable to damp the sudden dust discharge after start-up, the number of the start-ups should be reduced, and the duration of the start-up should be as short as possible. Relatively heavy iron-containing particles can be separated in settling chambers at the boiler end.

56948

APTIC NO. 81560

Toyota Motor Sales Co., Ltd.

EXPLANATION OF THE TOYOTA CATALYTIC SYSTEM (TTC-C) OF TOYOTA 4M-U TYPE ENGINE. *(Toyota 4M-U gata enjin Toyota shokubai hoshiki (TTC-C) no kaisetsu). Text in Japanese. Gijutsu Joho (Serv. News), no. 58:4-13, Aug. 1975.*

The Toyota catalytic system was developed exclusively for the Toyota Century and Crown 2600 in compliance with the 1975 emission control standard. This catalytic system employs catalytic oxidation, secondary air injection, and exhaust gas recirculation. The formation of carbon monoxide, hydrocarbons, and nitrogen oxides are controlled by adjusting the carburetor and ignition timing, and by engine modifications such as those to the combustion chamber and intake and exhaust manifolds. The CO and HC that are produced are treated by secondary air injection and a catalytic converter. Descriptions of the catalytic oxidation system (the catalytic converter, the catalyst, the durability of the the catalyst), the secondary air injection system, the exhaust gas recirculation system, the ignition timing controlling system, the catalyst temperature control system, the auxiliary control system, the deceleration control system, and the over- heating alarm system are given, with parts specifications and flow sheets.

56949

APTIC NO. 81698

TWO CYCLE LAYER TYPE GAS SUPPLIER. *(2 saikuru shiki sojo kyuki kikan). Text in Japanese. (Onishi, Shigeru, Saburo, Yui, and Katsuji Shoda (Japan)) Japan. Model Util. Sho 50-25845. 6p., Aug. 2, 1975. (Appl. Nov. 24, 1970, 1 claim).*

A 2-cycle piston engine using a homogeneous mixture gas for ignition is described. The device features a cylinder with an exhaust hole and a gas inlet hole which are opened and closed with respect to the motion of a pistonn in the cylinder, and an electric ignition plug without a dynamic valve. A control valve is equipped at the mixture gas path connecting to the gas inlet hole. At idling, gas is supplied corresponding to the opening of the control valve, and only a small portion of the gas is introduced as gas layers for combustion during igition so that there is no misfire. The cylinder head is wedge shaped with its narrow end pointing toward the same direction in which the mixture gas is introduced. A pit having no constricted part is equipped in the cylinder head. The device has the advantage that gas is supplied in layers which provides homogeneous engine operation from idling to full load without misfire.

56950 **APTIC NO. 81712**

Fuji Heavy Industries Co., Ltd. (Japan)

SUMMARY OF THE SUBARU LEONE ESTATE STATION WAGON 1200 STD AS A LOW-POLLUTION AIR. *(Subaru leone esutato ban 1200 STD haigasu kisei tekigosha no gaiyo). Text in Japanese. Gijutsu Joho (Serv. News), no. 50:32-33, Aug. 1975.*

The new Subaru Leone Estate Station Wagon 1200 STD recently put on the market complies the 1975 exhaust emission standard. In this vehicle, the ignition timing control method is adopted as pollution control device. The emission level of Subaru and 1975 emission standards (g/km) for 10 mode driving are 12.0 and 17.0 for carbon monoxide, 2.00 and 2.7 for hydrocarbons, and 1.50 and 2.3 for nitrogen oxides, respectively. Descriptions of the vehicle and exhaust gas cleansing system with characteristic advantages are given. The structure and function of the controller (vacuum advance), dash pot, choke pilot, and water temperature switch are described with installation and adjustment procedures.

1974

56951 **APTIC NO. 75244**

Ando, Jumpei

UTILIZING AND DISPOSING OF SULFUR PRODUCTS FROM FLUE GAS DESULFURIZATION PROCESSES IN JAPAN. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 955-968, Dec. 1974. 4 refs. (Nov. 4-7.)*

Japanese developments in the utilization of flue gas desulfurization by-products are reviewed. The by-product sodium sulfite generated by sodium scrubbing processes is currently being produced at 350,000 tons/yr and is already filling the demand of paper mill users. Sulfuric acid production resulting mainly from Wellman-Lord desulfurization processes is expected to reach 1000 tons/day by 1975. Gypsum which is considered to be the most rational by-product due to the increasing demand for wallboard and cement is expected to be produced at the rate of 6000 tons/day by 1975. Thee production of ammonium sulfate by ammonia scrubbing plants is currently being considered for export to the fertilizer market. The development of a synthetic paper from calcium sulfite and polyethylene is underway to utilize the calcium sulfite obtained from wet lime processes. New uses for gypsum in building materials are also being researched.

56952 **APTIC NO. 75236**

Bailey, E. E.

CONTINUING PROGRESS FOR WELLMAN-LORD SO2 PROCESS. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 745-759, Dec. 1974. (Nov. 4-7.)*

The proposed installation and testing of a Wellman-Lord sulfur dioxide control process designed to serve two coal-fired power plants (330 and 340 MW) is described. The entire SO2 and particulate removal process is to consist of a gas handling area for each plant, an area for the reduction and concentration of the by-product purge stream, an SO2 reduction plant for the production of elemental sulfur, and an absorbing solution regeneration plant. Each gas handling area is designed to process 1,588,000 acfm of gas containing between 700 and 1200 ppm by volume of SO2. The fly ash loading of the incoming gas will range between 0.06 and 0.04 grains/acf. A flue gas with an SO2 concentration of 1200 ppm requiring 90% removal takes four to five stages of the process, while flue gases with higher concentrations, e.g., 3000 ppm, requiring 95% removal may need only three stages due to the higher driving force of the more highly concentrated gas.

56953 **APTIC NO. 75252**

Ball, F. JJ., G. N. Brown, A. J. Repik, and S. L. Torrence

WESTVACO ACTIVATED CARBON PROCESS FOR SOX RECOVERY AS ELEMENTAL SULFUR. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 1151-1191, Dec. 1974. 5 refs. (Nov. 4-7.)*

The Westvaco activated carbon process for the recovery of sulfur dioxide in flue gas as elemental sulfur is described along with pilot plant tests. The all dry, fluidized bed process was demonstrated in a 20,000 cfh integral pilot plant, with the granular carbon being continuously recycled over 20 times between a flue gas slipstream of an oil-fired boiler for the SO2 removal and recovery steps. The performance of the carbon remained at a high level over 300 hr of testing and showed no undue chemical or mechanical loss. Over 90% of 2000 ppm SO2 was removed from the flue gas as sulfuric acid by catalytic oxidation and subsequent hydrolysis within the carbon granule. In the first of two recovery steps, the acid-loaded carbon was initially contacted at 300 F with internally produced hydrogen sulfide for the conversion of the acid to elemental sulfur. The by-product sulfur was then thermally stripped from the carbon, and the required H2S was produced by reacting the remaining sulfur on carbon with an external source of hydrogen at 1000 F. The estimated capital and operating costs for a system of serving a 1000 MW utility boiler are $35/KW and 2 mil/KW-hr, respectively. (Author abstract modified)

56954 **APTIC NO. 78249**

Bonnifay, P., A. Billion, G. Heinrich, and A. Hennico

PURIFICATION OF DISTILLATION RESIDUES. *(Purificazione dei residui della distillazione). Text in Italian. Nuovo Chim. (Rome), 50(12):43-46, Dec. 1974.*

The French Petroleum Institute (IFP) has developed a process for making a low-sulfur fuel oil in a clean refinery. This involves fractionating the residue of atmospheric distillation in a vacuum rectifier and sending the product directly to a hydrodesulfurization plant. The vacuum distillation residue is deasphaltized, producing heavy oils low in sulfur and metals, plus an asphalt residue. A separate hydrodesulfurizing plant is used for the deasphaltized oils, with hydrogen for the process being obtained in this case by partial oxidation of the residual asphalt. A heavier solvent (C5-C6) is used for the deasphaltization. The system has been in operation since 1966 and delivers 150,000 barrels a day. Sulfur dioxide is removed from the exhaust gases in 2 stages: use of ammonia water to form a sulfite brine; treatment of brine to obtain elemental sulfur and ammonia for recycling. Of the three leading methods, the IFP procedure is preferable for petroleum with a high metal content and is generally more flexible in the treatment of a variety of crudes.

56955 **APTIC NO. 75249**

Breed, Claude E. and Gerald A. Hollinden

TVA EPA PILOT-PLANT STUDY OF THE AMMONIA ABSORPTION-AMMONIUM BISULFATE REGENERA-

TION PROCESS. Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 1069-1107, Dec. 1974. 9 refs. (Nov. 4-7.)

Pilot plant studies with an ammonia absorption-ammonium bisulfate regeneration process for the removal of sulfur dioxide from flue gas generated at the Tennessee Valley Authority s coal-fired Colbert generating plant are described. Sulfur dioxide removal efficiencies of over 90% were obtained along with low ammonia losses. Absorber product liquors that were amenable to regeneration were also produced. The prewash section was operated open loop to minimize corrosion, though the final process design requires that it be closed. Fume formation inside the absorber was controlled while operating at relatively high salt concentrations, although avoiding fume formation on days of low temperature and high relative humidity may be impractical. Precipitated solids in the absorber liquor may present problems in the regeneration section. Most of the absorbed SO2 can be released in the acidulator and stripper, but the remaining SO2 creates problems in the evaporator. The acidulator and stripper are being redesigned to achieve a complete release of SO2. (Author abstract modified)

56956 **APTIC NO. 74020**

Coon, C. W.

TECHNOLOGICAL IMPROVEMENTS TO AUTOMOBILE FUEL CONSUMPTION. VOLUME IIA: SECTIONS 1 THROUGH 23 (FINAL REPORT). *Southwest Research Inst., San Antonio, Tex., Dept. of Automotive Research, Department of Transportation and Environmental Protection Agency Contract DOT-TSC-628, Work Unit OS514/R5523, Rept. DOT-TSC-OST- 74-39.IIA, 236p., Dec. 1974.*

NTIS: PB 238678

A preliminary survey of the technological feasibility of reducing automobile fuel consumption by 30% while maintaining 1976 Interim Standards for carbon monoxide, hydrocarbon, and nitrogen oxide emissions was performed. The reference vehicle was a standard 1973 automobile having a 350 cu in. engine and a curb weight of 4300 lb. Evaluation of individual improvements led to three synthesized vehicle designs: a conventional spark ignition engine with electronic fuel injection, a catalytic reactor, spark advance control, and exhaust gas recirculation; a stratified charge engine with a catalytic reactor and possibly exhaust gas recirculation; and a turbocharged diesel engine. Evaluation procedures and results from dynamometer and road tests are presented in this volume.

56957 **APTIC NO. 81187**

Dybcynsky, Krystyna

POLAND S ENVIRONMENTAL PROGRAM COSTS TOO MUCH. MAIN PROBLEMS: WATER- AND AIR CONSERVATION. *(Polens Umweltplaene kosten viel. Hauptoprobleme: Wasser- und Luftreinhaltung). Text in German. Tech. Umweltmag., (6):38-41, Nov./Dec. 1974.*

A status report and plans for water protection and clean air maintenance in Poland are presented. Air pollution, which is due mainly to energy generation processes with the prevalence of sulfur dioxide and particulate emissions, shows an upward trend due to the increasing energy supply and to the eminent place of coal among energy carriers. Its share is expected to drop to 65% by the year 2000. Dry and wet desulfurization of coal, flue gas desulfurization (especially by the ammonia process), underground coal gasification, the conversion of coal to synthetic fuels with reduced sulfur content, and efficient fly ash separators are being studied. Cooperation with the USA in this area is envisaged. High stacks, increased flue gas discharge velocities in new power plants, and the extensive use of remote heating in residential areas are expected to contribute to a further reduction of the SO2 concentrations at ground-level. The 20-min-average of SO2 around power plants has been reduced from 0.6 mg/cu m to 0.4 mg/cu m. New dust separators require $200,000,000 investment during the current 5-year-plan, and $2,000,000,000 will have to be spent on clean air maintenance, including research and development, until 1990.

56958 **APTIC NO. 75240**

Elder, H. W.

FLUE GAS DESULFURIZATION BYPRODUCT DISPOSAL/UTILIZATION. REVIEW AND STATUS. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 851-863, Dec. 1974. 5 refs. (Nov. 4-7.)*

The disposal or utilization of flue gas desulfurization byproducts is discussed. Processes that produce waste products include: lime/limestone scrubbing, double alkali processes, dilute acid neutralization with lime or limestone, and sodium salt scrubbing. Although calcium reaction products are normally considered as waste materials, gypsum has potential for use as material for wallboard construction or for use as a cement additive. Processes that recover sulfur in a useful form include: magnesium oxide scrubbing with thermal regeneration, sodium salt scrubbing with thermal regeneration, catalytic oxidation, and dry absorption- reduction with copper oxide. Catalytic oxidation converts dilute sulfur dioxide to sulfur trioxide, resulting in the direct production of sulfuric acid; while the other processes produce a relatively concentrated stream of SO2 that can be converted to sulfuric acid. The most logical recovery product is sulfuric acid because most of the sulfur used is in this form; however, the most practical form for storage and shipping is elemental sulfur. The most sophisticated technology being developed for disposal of waste solids involves chemical fixation. Site selection for waste disposal depends on various factors, particularly geography. For rural areas where real estate is available, the use of ponds is acceptable; whereas dewatering, compaction, or fixation might be justified if the trade-off in cost for transportation to an alternate site offsets the value of adjacent land.

56959 **APTIC NO. 81267**

Grzywinski, Richard J.

UPDATING INCINERATORS FOR AIR POLLUTION ABATEMENT. *Public Works, 105(12):48-50, Dec. 12, 1974.*

The installation of a particulate control system on a continuous type municipal incinerator with an actual daily capacity of 750 tons/day is described. The heart of the control system is an electrostatic precipitator. Gas entering the precipitator is controlled to a temperature of 550 F by a bank of 20 air-atomized water spray nozzles with control valves which respond to the precipitator inlet temperature. Sufficient retention time for the spray water droplets to evaporate before entering the precipitator is provided by two in-line steel towers. Although the performance of the precipitator is not yet verified, visual results are encouraging. The total project cost for particulate control system is $3,219,008.

56960 **APTIC NO. 73086**

Hamshar, J. A., H. D. Terzian, and L. J. Scotti

CLEAN FUELS FROM COAL BY THE COED PROCESS. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 147-157, Oct. 1974. 7 refs.*

The COED (Char-Oil-Energy Development) process for the conversion of practically any type of coal into very-low-sulfur synthetic crude oil, clean fuel gas, and char is described. Volatile products released from the coal during reaction in fluidized-beds pass to a product recovery system where oil liquor (water), and gases are separated. The pyrolysis oil is filtered to remove solids and is then hydrodesulfurized in a fixed-bed catalytic reactor. The pyrolysis gas is a medium heating-value gas than can be sold as clean fuel gas or can be converted to hydrogen for sale. The char product can be burned directly in a boiler if the sulfur content is low enough to meet emission standards; alternatively, the char can be gasified to produce additional clean fuel gas for power generation. Essentially all of the sulfur in the coal is converted into hydrogen sulfide which is readily recovered as elemental sulfur by conventional techniques. Dust problems are controlled with cyclones and bag filters in the coal preparation and char handling facilities. Fines collected from the pyrolysis plant that escape cyclone collection can be collected by wet scrubbing. Data obtained from a 36 ton/day pilot plant indicate that a 25,000 ton/day COED plant with added char gasification can produce syncrude at $7-$9/barrel and fuel gas at $0.70-$0.80/million Btu. (Author abstract modified)

56961 **APTIC NO. 71564**

Hoehn, F. W. and M. W. Dowdy

FEASIBILITY DEMONSTRATION OF A ROAD VEHICLE FUELED WITH HYDROGEN-ENRICHED GASOLINE. *Preprint, 10p., 1974. 13 refs. (Presented at the Intersociety Energy Conversion Engineering Conference, San Francisco, Calif., Aug. 26-30, 1974.)*

Emission tests were performed on a conventional internal combustion engine modified to use a hydrogen-enriched gasoline mixture to allow for burning at ultralean mixtures. Both multicylinder engine dynamometer tests and vehicle tests (Federal Test) were performed. The modified vehicle showed carbon monoxide emissions of 1.5 g/mi, nitrogen oxide emissions of 0.5 g/mi, and hydrocarbon emissions of 2.6 g/mi as compared with the 1977 Federal standards of 3.4, 0.4, and 0.41 g/mi, respectively. Thus, the 1977 CO standard was met, and the 1977 NOx standard nearly met. The increased hydrocarbon emissions observed after modification illustrated the need for further research to develop effective methods of control. The hydrogen requirement to avoid engine misfire at ultralean conditions was about 15% by weight of the gasoline. Performance and drivability of the modified vehicle were satisfactory.

56962 **APTIC NO. 75241**

Ifeadi, C. N. and H. S. Rosenberg

LIME/LIMESTONE SLUDGE DISPOSAL - TRENDS IN THE UTILITY INDUSTRY. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 865-885, Dec. 1974. 4 refs. (Nov. 4-7.)*

Trends in the disposal of calcium-sulfur sludges generated by lime/limestone flue gas desulfurization processes are reviewed, with particular reference to the utility industry. Currently, 12 full-scale utility plants demonstrated the potential to generate such sludges at the annual rate of about 2.5 million metric tons (50% moisture), and by 1980 lime/limestone scrubbing systems may generate as much as 120 million metric tons of sludge (50% moisture). Depending on economics and local conditions, utilities may practice ponding only or a combination of ponding and/or other mechanical pretreatment processes. Ponding without pretreatment is practiced in regions where there is relatively inexpensive land and/or abundant solar energy to aid evaporation. Clarification and vacuum filtration are common in regions with a high land cost or with wetter and colder climates. The current popular disposal methods used by the utility industry are ponding and landfill. Disposal through utilization is not yet practiced on full-scale, and most of the various by-product uses are thus far economically unattractive. (Author abstract modified)

56963 **APTIC NO. 75237**

Jamgochian, E. M. and W. E. Miller

THE CAT-OX DEMONSTRATION PROGRAM. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Environmental Protection Agency Research Grant, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 761-806, Dec. 1974. 2 refs. (Nov. 4-7.)*

The installation and operation of a catalytic oxidation process for the removal of sulfur dioxide from flue gas generated by a 15 MW steam plant are described along with a proposed 1-year test program of the system. Although start-up and operational problems are being encountered, the principle of the operation is proven. The system is capable of removing at least 85% SO2 from the flue gas as 78% sulfuric acid and can remove essentially all of the fly ash in the exit stream. A 1-year test program is scheduled to investigate such variables as the operating characteristics and process performance relative to SO2 and fly ash removal, H2SO4 recovery, and mist/gaseous emissions; the response of the process to fuels of varying sulfur content, load, excess air, and soot blowing; precipitator efficiency and outlet grain loading; the thermal efficiency of the regenerative heat exchanger and seal leakage with time; converter efficiency, longevity of the catalyst, and catalyst makeup; mist eliminator performance and the required frequency of washing; and corrosion rates of process materials and components.

56964 **APTIC NO. 73101**

Jonke, A. A. and W. Podolski

OVERVIEW OF R AND D NEEDS ON ENVIRONMENTAL ASPECTS OF COAL- CONVERSION PROCESSES. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 361-365, Oct. 1974. 5 refs.*

The environmental factors related to various types of coal conversion processes are reviewed. The conversion of coal to liquid or gaseous fuels does not automatically assure an improved environment. Pollutants, such as ash and sulfur, must be removed from the coal-derived fluids to levels even lower than conventional coal-burning power plants. Unless more efficient power cycles are developed, the overall thermal effects of coal conversion may be greater than those for conventional power plants. The quantification of the environmental problems for each coal-conversion process is needed, and the commonalities and differences of the various processes must be weighed. A systems analysis study will be needed to provide the basis for intelligent planning for the utilization of coal energy with minimum adverse environmental, health, and safety effects. (Author abstract modified)

56965 **APTIC NO. 75232**

Koehler, George R. and Edward J. Dober

NEW ENGLAND SO2 CONTROL PROJECT. FINAL RESULTS. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Environmental Protection Agency Contract CPA 70-114, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 671-708, Dec. 1974. 9 refs. (Nov. 4-7.)*

A magnesia slurry system for sulfur dioxide control that employed a single stage venturi scrubber to treat all of the flue gas from an oil fired boiler powering a 150 MW steam generator was field tested for over 4000 hr running time. The process was successful in removing SO2 particulates from a high sulfur fuel oil flue gas, SO2 removal efficiencies were over 90%. High quality 98% sulfuric acid was recovered, with over 5000 tons of the acid being produced by magnesium sulfite and marketed in the conventional manner. More than 3000 tons of magnesia were regenerated and recycled, and over 6800 tons of MgSO3 were processed. Correlations were developed to predict process control of SO2 removal for various design requirements. Studies of the physico-chemistry of the process yielded data on the kinetics of MgSO3 hydrate formation and transformation, the activation phenomena of regenerated magnesium oxide slaking, and the formation and influence of magnesium sulfate in the system.

56966 **APTIC NO. 73902**

Kubota, Toshiaki, Haruo Sakurada, and Morio Yamada

STUDY ON NITROGEN OXIDES REMOVAL TECHNIQUE. *(Chisso sankabutsu jokyo ni kansuru kenkyu). Text in Japanese. Kansai Denryoku K. K. Soken Hokoku (Rep. Inst. Kansai Electr. Power Co. Inc.), no. 14:218-221, Sept. 1974.*

Activated carbon absorption, ozone oxidation, and catalyzed ammonia reduction methods for nitrogen oxides removal from flue gases generated by power stations are studied. The nitric oxide removal efficiency by activated carbon was better than 90% if the flue gas contained more than 1% oxygen, however, the efficiency dropped with decreased oxygen content; the efficiency was 10 to 15% for gas with zero oxygen content. The desence of sulfur dioxide in the flue gas did not affect the NOx removal efficiency by the activated carbon. The deactivation of carbon occurred faster when the moisture content in the flue gas was higher. The NOx removal efficiency dropped to 40% after a 6-hour absorption of flue gas containing 150 ppm NOx and 17% moisture. The regeneration of deactivated carbon could be made by heating at 150 C to 200 C. The presence of sulfur dioxide in flue gas decreased the NOx removal efficiency by the O3 oxidation method, since ozone oxidized SO2 to sulfur trioxide. Therefore the required amount of ozone gas for NOx treatment was more for the flue gas containing SO2. The gas temperature affected the NOx removal efficiency by the O3 method and better efficiency resulted with the lower temperature of flue gas owing to the decomposition of ozone at high temperature. Several catalysts were used for the ammonia reduction method. The highest denitrification efficiency (more than 90%) was achieved with a catalyst of 5% copper - 5% nickel on aluminum - magnesium oxide mixed substrate at a temperature of 350 C to 400 C. Increased temperatures above 400 C resulted in decreased efficiency because of the NO formation within the system. The presence of oxygen increased the denitrification efficiency; however, the presence of SO2 inhibited the activity of NH3, thus decreasing the efficiency.

56967 **APTIC NO. 75231**

LaMantia, C. R., R. R. Lunt, J. E. Oberholtzer, E. L. Field, and N. Kaplan

EDA-ADL DUAL ALKALI PROGRAM - INTERIM RESULTS. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 549-665, Dec. 1974. 9 refs. (Nov. 4-7.)*

NTIS: PB 242572/AS

Findings from laboratory and pilot plant studies of dual alkali flue gas desulfurization processes for high and low sulfur fuel applications are discussed. Studies were conducted on lime regeneration (concentrated mode), sulfuric acid treatment (concentrated mode), limestone regeneration (concentrated mode), and limestone/lime dilute modes. Each mode was characterized in terms of SO2 removal, chemical yields, oxidation, sulfate regeneration, waste solids characteristics, and soluble solids losses. Typical results for the concentrated lime mode show SO2 removal efficiencies ranging from 91-95% and calcium utilization efficiencies of from 96-98%. Inlet SO2 levels were 2600-2800 ppm at scrubbing feed stoichiometries of 1.1-1.2.

56968 **APTIC NO. 75243**

Lord, William H.

FGD SLUDGE FIXATION AND DISPOSAL. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 929-954, Dec. 1974. 2 refs. (Nov. 4-7.)*

Experimental developments dealing with the fixation and disposal of sludge generated by flue gas desulfurization processes are reviewed. A series of additives called CALCILOX which turn the thixotropic calcium sulfite-sulfate slurries into reasonably high-strength, low permeability materials are presently available. The feasibility of this solution is being tested on a proto-type installation and is going to be used in the future in a large, 21,000 wet tons/day, disposal operation. Cost estimates for a long-term disposal system, from conception to final design and construction, are on the order of $2-4/ton of coal burned. Landfill disposal appears to be the only currently feasible and acceptable disposal method, and landfills constructed with stabilized flue gas desulfurization sludges are capable of meeting all engineering, environmental, and ecological requirements.

56969 **APTIC NO. 75235**

Mann, E. L.

THE DEAN H. MITCHEL STATION (NORTHERN INDIANA PUBLIC SERVICE COMPANY) WELLMAN-LORD (DAVY POWER GAS INC.) ALLIED CHEMICAL CORPORATION SO2 EMISSION CONTROL FACILITY. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Environmental Protection Agency Contract Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 740-744, Dec. 1974. (Nov. 4-7.)*

A proposed demonstration flue gas desulfurization system for a 115 MW pulverized coal-fired electric utility boiler is described. The system to be installed and tested consists of a Wellman-Lord sulfur dioxide recovery process and an Allied Chemical SO2 reduction process for the production of elemental sulfur having a minimum assay of 99.5%. The system is designed to operate at a minimum of 90% SO2 removal for coal with a 3.5% sulfur content. The process is also guaranteed not to allow any emission in excess of 200 ppm by volume of SO2 in the exit gas with lower sulfur fuel. Capitalization is expected to be $13,441,434, and operation and maintenance is estimated at $4,977,186.

56970 **APTIC NO. 81416**

Matros, Y. S., V. A. Kirillov, M. I. Gavrilenko, Y. L. Krichevskaya, and M. G. Slin ko

AUTOMATIC CONTROL SYSTEM FOR A REACTOR OXIDIZING SULFUR DIOXIDE AT INCREASED INITIAL CONCENTRATION. *(Razrabotka sistemy avtomaticheskogo regulironvaniya reaktora okisleniya sernistogo gaza pri povyshennoi nachal noi kontsentratsii). Sov. Chem. Ind. (English translation from Russian of: Khim. Prom., 6(9):592-596, Sept. 1974. 18 refs.*

One of the principal ways to intensify the sulfuric acid process is to increase the initial concentration of sulfur dioxide in the feed gas. When the sulfur dioxide concentration is high enough that equilibrium is not reached in the first catalyst bed, disturbances in the input parameters can lead to overheating and failure of the catalyst. A mathematical simulation method is used to work out a reliable system for automatically stabilizing the temperature in the first bed. The effective heat conductivity of a grain and the coefficients of external mass and heat exchange were calculated. The mathematical description of a process on a single grain when equilibrium is established instantaneously is given. Transient regimes were calculated for several values of various parameters to determine which of the parameters do not affect the inertial properties of the catalyst grain. An equation is given describing the nonsteady-state processes on the catalyst grain. A mathematical description is also given of transient modes in the bed. This system of equations was solved by computer. An automatic stabilization system for the first catalyst bed was calculated. The temperature in the bed can be stabilized automatically through changes in the temperature at the inlet to the bed. Because of the large time lag of the bed, a cascade-type automatic control system was chosen. The operation of the automatic stabilization system is strongly influenced by the heat capacity of the inert packing upstream and downstream of the catalyst bed and the heat capacity of the metal of construction. An analog computer was used to compare various locations for the temperature sensor. Mounting the sensor about one fourth of the way along the bed from the inlet minimizes the dynamic deviation and the duration of the transient process.

56971 **APTIC NO. 75248**

McKinney, W. A., W. I. Nissen, D. A. Elkins, and J. B. Rosenbaum

PILOT PLANT TESTING ON THE CITRATE PROCESS FOR SO2 EMISSION CONTROL. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 1049-1067, Dec. 1974. 6 refs. (Nov. 4-7.)*

Pilot plant tests of the Bureau of Mines citrate process for removing sulfur dioxide from industrial waste gases are reviewed. The citrate process involves the absorption of SO2 in a solution of sodium citrate, citric acid, and sodium thiosulfate followed by the reaction of the absorbed SO2 with hydrogen sulfide to precipitate elemental sulfur and to regenerate the citrate solution for recycling. Two pilot plants operating with the citrate process produced tail gas containing less than 50 ppm SO2 from stack gas containing 1000 to 5000 ppm SO2. Another citrate pilot plant with a nominal capacity of 1000 standard cu ft/min of 0.5% SO2 gas yielded 1/3 ton of sulfur/day. The projected operating cost for a citrate plant serving a 1000 MW coal-burning generating station is about $14,000,000/yr.

56972 **APTIC NO. 77484**

Mizuhata, T., M. Ikeda, I. Maeda, and H. Hata

THE BEHAVIOR OF NITROGEN OXIDES IN THE EXHAUST GASES FROM IRON MELTING FURNACE AND THE EFFECT OF COMBUSTION CONDITIONS ON THE BEHAVIOR OF NITROGEN OXIDES. *(Tetsu yokairo no sogyo ni tomonau haigasu chu no chisso sankabutsu no kyodo oyobi koro ni taisuru nensho joken no eikyo). Text in Japanese. Okayama Kogai Boshi Center Kenkyu Hokoku (Bull. Okayama Prefect. Pollution Control Cent.), 2(1):15-19, 1974. 4 refs.*

Factors affecting the formation of nitrogen oxides in the exhaust gas of iron melting furnaces were investigated. When the supply of secondary air was decreased by 10 and 20%, the concentration of NOx in the discharged gas was decreased by 14 and 30%, respectively. The amount of total discharged gas was also decreased by 7 and 20%, repectively. Calculations from these data showed that the total amount of discharged NOx decreased by 20 and 47%, respectively. Even when the supply of secondary air was suppressed only during the period of melting, the period when the NOx discharge is the largest, the concentration in the discharged gas still decreased by 13 and 45%, respectively. The total gas discharge decreased by 5 and 23%, respectively. The total amount of NOx discharge decreased by 17 and 58%, respectively. When the supply of the secondary air was decreased by 23% of the conventional supply, the NOx concentration decreased by 54%. The amount of discharged gas decreased by 30%. The total amount of discharged NOx decreased by 68%. Operation became impossible when the supply of secondary air was decreased by more than 23%.

56973 **APTIC NO. 71906**

Nelson, P. A., A. A. Chilenskas, and R. K. Steunenberg

THE NEED FOR DEVELOPMENT OF HIGH-ENERGY BATTERIES FOR ELECTRIC AUTOMOBILES. *Argonne National Lab., Ill., Chemical Engineering Div., Nonnuclear Energy Sources and Energy Conversion Devices Rept. UC-13, 24p., Nov. 1974. 32 refs.*

NTIS: ANL-8075

The environmental impact and requirements of high-energy batteries for electric automobiles are discussed. Electric cars would reduce the demand for oil, provide more efficient utilization of energy resources, and reduce air pollution. Equivalent ground level emissions were estimated for gasoline powered motor vehicles and electric powered motor vehicles for 1980 for total particulates, respirable particulates, benzo(a)pyrene particulates, sulfur dioxide, nitrogen oxides, carbon monoxide, and hydrocarbons. A battery with a specific energy of 150 W-hr/kg and a peak specific power of 200 W/kg seems feasible. A battery with these characteristics weighing 230 kg and storing 35 kW/hr would power a 1275-kilogram car at speeds and acceleration rates commensurate with gasoline cars and would provide a range of 100 mi. (Author summary modified)

56974 **APTIC NO. 75239**

Noguchi, Masaaki

STATUS REPORT ON CHIYODA THOROUGHBRED 101 PROCESS. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 837-850, Dec. 1974. 4 refs. (Nov. 4-7.)*

The Chiyoda Thoroughbred 101 Process for the removal of sulfur dioxide from flue gas is described along with the status of its commercial application. The process combines water scrubbing with catalytic oxidation for the conversion of SO2 to sulfuric acid. The resulting weak acid is circulated as an absorbent of SO2, and a part is neutralized with limestone to produce the by-product gypsum. The process is operating satisfactorily in 10 commercial installations, with the largest plant currently in operation serving a 250 MW boiler. All plants are achieving SO2 removal efficiencies of over 90%.

56975 **APTIC NO. 75233**

Quigley, Christopher P. and James A. Burns

ASSESSMENT OF PROTOTYPE OPERATION AND FUTURE EXPANSION STUDY - MAGNESIA SCRUBBING MYSTIC GENERATING STATION. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Environmental Protection Agency Contract CPA 70-114, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 709-727, Dec. 1974. (Nov. 4-7.)*

Field testing of a magnesia slurry venturi scrubbing system designed to remove sulfur dioxide from the flue gas of a 156 MW oil-fired generating unit is reported, with particular emphasis on scrubber operation and maintenance. Sulfur dioxide removal efficiencies averaged 91.1% with the use of regenerated MgO, and over 5000 tons of commercial grade sulfuric acid was produced and sold as by-product. Scrubber availability over various test periods ranged from 17-68%; the major area of maintenance was associated with erosion/corrosion of slurry pumps, large isolation valves and expansion joints around recycle pumps, and various piping. The capital investment in the scrubber plant which included a centrifuge and drying facilities amounted to $3,635,000. The total operation maintenance costs over the 2-year test program were $999,000.

56976 **APTIC NO. 75227**

Rossoff, J., R. C. Rossi, L. J. Bornstein, and J. W. Jones

DISPOSAL OF BY-PRODUCTS FROM NON-REGENERABLE FLUE GAS DESULFURIZATION SYSTEMS. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 399-443, Dec. 1974. 18 refs. (Nov. 4-7.)*

NTIS: PB 242572/AS

Untreated flue gas desulfurization sludges from non-regenerable scrubber systems using limee or limestone as the absorbent at several eastern and western coal-burning power plants are chemically analyzed and showed levels of mercury, selenium, boron, chloride, sulfate, and total dissolved solids considerably in excess of water quality criteria. Since soil attentuation of selenium, boron, and chloride is ineffective and since the remaining sludge liquor constituents preclude direct discharge to streams, the need for environmental control of sludge disposal sites is strongly indicated. The water-retentive properties of untreated sludge also present land reclamation difficulties. Currently available disposal methods include landfilling with chemically treated sludge and sludge disposal in ponds lined with highly impermeable materials. Disposal costs are estimated at from $2-$9/ton for chemical fixation and from $2.50-$4.50/ton for ponding, exclusive of possible subsequent pond reclamation costs. Other less developed disposal techniques include drying and conversion to gypsum.

56977 **APTIC NO. 73941**

Schultz, Donald F.

MODIFICATIONS THAT IMPROVE PERFORMANCE OF A DOUBLE ANNULAR COMBUSTOR AT SIMULATED ENGINE IDLE CONDITIONS (TECHNICAL MEMORANDUM). *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Work Unit 501-24, Rept. NASA TM X-3127, E-7960, 30p., Dec. 1974. 7 refs.*

NTIS: N 75-12953

Techniques involving radial fuel staging, the use of radial-inflow rather than axial-flow air swirlers, and the optimization of fuel-nozzle spray angle and differential pressure were evaluated to determine if simple gas turbine combustor modifications could be used to reduce aircraft idle emissions of carbon monoxide and hydrocarbons. Combustion efficiency was significantly increased with radial fuel staging; at low idle with a fuel-air ratio of 0.008, the combustion efficiency increased from 47-69.5% and at high idle it increased from 90-96%. Carbon monoxide emissions at high idle decreased from 130 to 178 g/kg fuel, and hydrocarbon emissions decreased from 69 to 16 g/kg fuel. The hydrocarbon emission index decreased from 16 to 7.5 g/kg fuel with combustion in the inner annulus only when the fuel-air ratio was increased from 0.008 to 0.012; in like manner the carbon monoxide emission index decreased from 78 to 59 g/kg fuel. The maximum value of nitrogen oxides at idle remained relatively low at 1.8 g/kg fuel after the modifications.

56978 **APTIC NO. 74601**

Stone, Ralph and David E. Brown

FORECASTS OF THE EFFECTS OF AIR AND WATER POLLUTION CONTROLS ON SOLID WASTE GENERATION. *Stone (Ralph) and Co., Inc., Los Angeles, Calif., Environmental Protection Agency Contract 68-03-0244, Rept. EPA-670/2-74-095b, 799p., Dec. 1974. 440 refs.*

NTIS: PB 238 819

The solid wastes from pollution control were identified for individual industrial sectors by their original air and water pollutant constituents, and the treatment process applied. The wastes were categorized type and by location (rural or urban). Total solid wastes from pollution control activities were estimated for 1971 and projected for 1975, 1980, and 1985. Particulates and sulfur oxides were the major air pollutants capable of generating solid wastes when treated. Suspended solids and biological oxygen demand were identified as the principal sources for the impact of water pollution on solid wastes. Important industrial sources of solid wastes included power plants, paper and pulp, chemicals, cement and clay, steel furnaces, nonferrous smelting and refining, sewerage systems, and hazardous wastes from uranium mining. Mine tailing ponds were a greater source than the above sources. They are not, however, an urban landfill disposal problem since they are usually located in rural areas. (Author abstract modified)

56979 **APTIC NO. 72105**

Takagi, Hiroaki

THE STATUS QUO IN NITROGEN OXIDES PREVENTION TECHNIQUES IN FIXED SOURCES. *(Kotei hasseigen ni okeru NOx boshi gijutsu no genjo). Text in Japanese. Seikatsu to Kankyo (Life Environ.), 19(11):27-31, Nov. 1974.*

Techniques of nitrogen oxides prevention consist of those that limit its formation and those that eliminate it from exhaust gases. The former includes alteration of operating conditions, combustion methods, and combustion chambers and fuel conversion. There are two main routes of development of techniques for control of NOx formation. Boiler and heater manufacturers concentrate their efforts in developing two-stage combustion and recirculation methods. These techniques have been used in large-scale electric power generation with rates of NOx reduction of 20-40%. The other main technique is that of small NOx burners. Techniques of elemination of NOx from stack gases include dry and wet methods.

56980 **APTIC NO. 74205**

Tokuhiro, Tomoya and Masahiro Kobayashi

AIR CLEANING PLAN FOR A BUSINESS BUILDING (NO. 3 - A BASIC EXPERIMENT FOR CO CLEANING). *(Jimusho biru no kuki joka keikaku). Text in Japanese. Preprint, Japan Society of Heating, Air-Conditioning, and Sanitary Engineers, p. 71-74, 1974. 2 refs. (Presented at the Japan Society of Heating, Air-Conditioning, and Sanitary Engineers Annual Meeting, Tokyo, Japan, Oct. 7-8, 1974.)*

A catalytic device for removing low concentrations of carbon monoxide from gas streams is described. The catalyst consists of an activated carbon-platinum complex. The physical characteristics of the catalyst are: packing density, 0.44 g/cu m; particle average size, 4.25 mm; and specific area, 860 sq m/g. Carbon monoxide is introduced into a teflon bag where it is diluted with air. The humidity is adjusted by passing a portion of the gas through a silica-gel layer. The gas is then led to a converter packed with the catalyst. A catalyst particle size to converter diameter ratio of greater than 6.0 is desirable. No difference in the rate of conversion is observed at 10 to 100 ppm CO concentrations. The initial rate of conversion is 93% at a space velocity of 30,000/hr. At a space velocity of 30,000/hr and a total catalyst area of 8000 sq m, the rate of conversion decreases as the humidity increases. A high rate of conversion is maintained at temperatures as low as 20 C.

56981 **APTIC NO. 75226**

Van Ness, Robert P.

OPERATIONAL STATUS AND PERFORMANCE OF THE LOUISVILLE FGD SYSTEM AT THE PADDY S RUN STATION. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 389-398, Dec. 1974. (Nov. 4-7.)*

NTIS: PB 242572/AS

Operational experience with a carbide lime scrubber serving a 65 MW coal-fired electrical generation unit is reviewed. Sulfur dioxide is removed from the flue gas with a liquid to gas contactor, resulting in the formation of soluble calcium bisulfite; process chemistry is controlled so that the solid salts of salts calcium sulfite and calcium sulfate are not formed in the scrubber. Sulfur dioxide removal efficiency is between 80 and 90% for inlet concentrations of 2000 ppm. Scrubber availability ranges from a low of 70% to a high of 98%. No major problems of scaling or plugging are evident after a 9-month testing period.

56982 **APTIC NO. 81287**

Voltz, Sterling E. and David Liederman

THERMAL DEACTIVATION OF A PLATINUM MONOLITHIC CARBON MONOXIDE/HYDROCARBON OXIDATION CATALYST. *Ind. Eng. Chem., Prod. Res. Develop., 13(4):243-250, Dec. 1974. 13 refs.*

The thermal deactivation of a platinum monolithic carbon monoxide/hydrocarbon oxidation catalyst of the type used in automobile emission control systems was studied over a temperature range of 1400-2400 F. Relatively little change in activity occurred for the oxidation of carbon monoxide and propylene at a temperature of 1400 F, and the surface area was unchanged at this temperature. Solid-state phase changes occurred only above 2000 F. There was considerably more thermal deactivation at 1800 F, probably as a result of the growth of large platinum crystallites and a decrease in surface area. The major activity loss at a temperature of 2400 F corresponded to the growth of very large platinum crystallites, practically complete loss of surface area, solid state phase transformations in the ceramic support, and even some loss of platinum metal. Propane showed an increased sensitivity to thermal deactivation is compared with propylene; this increased sensitivity was probably related partially to a difference in oxidation kinetics.

56983 **APTIC NO. 75246**

Zonis, Irwin S., Francis Olmsted, Karl A. Holst, and David M. Cunningham

THE PRODUCTION AND MARKETING OF SULFURIC ACID FROM THE MAGNESIUM OXIDE FLUE GAS DESULFURIZATION PROCESS. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 1005-1028, Dec. 1974. 4 refs. (Nov. 4-7.)*

The technical feasibility of using sulfur dioxide recovered from magnesia slurry flue gas desulfurization processes for the production of sulfuric acid was established at a 50/ton day sulfuric acid plant. The economics of the magnesia process vary with location and appear most favorable in urban locations where some or all of the following conditions exist: off gas is capable replacing sulfur in captive sulfuric acid plants, significant cost advantages accrue from power plants using high sulfur fuel, freight rates from the magnesia source are not prohibitive, the desulfurization installation is new or retrofit is not complex, and reasonable capital financing is promoted by local regulatory agency rulings permitting equitable distribution of flue gas desulfurization costs to rates. (Author summary modified)

56984 **APTIC NO. 74170**

Seiko Chemical Engineering Co. (Japan)

THE SEIKO TYPE SULFUR DIOXIDE GAS RECOVERY SYSTEM. *(Seiko-shiki aryusan gasu kaishu sochi ni tsuite). Text in Japanese. Ryusan to Kogyo (Sulfuric Acid Ind.), 27(7):11-13, July 1974.*

A sulfur dioxide gas recovery system for a sulfuric acid manufacturing plant is described. Unreacted sulfur dioxide gas is recovered as sodium sulfite in 15% sodium hydroxide solution, after sulfuric acid mist which accompanies the sulfur dioxide gas (total gas concentration, 5000-8000 ppm) is removed by a mist catcher. The mist is recycled. A slight amount of remaining sulfur dioxide gas is put through a second absorption process before being released to the atmosphere. The process s recovery rate is 99.99%.

56985 **APTIC NO. 74317**

POLLUTION CONTROL AT THE FOS-SUR-MER PLANT OF SOCIETE UGINE ACIERS. *(La lutte contre la pollution a l usine de Fos-sur-Mer de la Societe Ugine Aciers). Text in French. Rev. Met. (Paris), 1974:813-818, Nov. 1974.*

Measures taken to control air and water pollution at the new Fos-sur-Mer steel mill of the Societe Ugine Aciers in France are described. Sulfur dioxide emissions are controlled by the use of natural gas and low-sulfur fuel oil. Oils and carbons are removed from the refining gas used in the electric-arc furnace. The flue gases from the electric-arc furnace are cooled and scrubbed to limit the residual dust emission to 150 mg/cu m. Dust generated in batch preparation processes and in the rolling-mill is also separated. Acid vapors from the pickling baths are neutralized with soda solution.

56986 **APTIC NO. 81056**

FUME INCINERATION WITH HEAT RECOVERY ADVANTAGEOUS IN PRINTING OF COATED STEEL SHEETS. *Ind. Heating, 41(4):54-56, April 1974.*

Direct flame fume incineration with heat recovery was used at a production can line to eliminate hydrocarbons emitted from solvents utilized in the bake process following lithographic printing of coated steel sheets for caps and closures. High solvent loadings sometimes occurred in the effluent, with resultant high heat release due to the calorific content of the solvents. The heat generated in the fume incineration process was used to preheat the incoming contaminated gases prior to incineration. Oven exhaust fumes were heated inside of the tubes of the heat exchanger before entering the combustion chamber. There they were exposed to a direct flame which oxidized the contaminants to carbon dioxide and water vapor. The hot gases left the chamber after at least 0.3 sec and passed over the outside of the heat exchanger tubes. A bypass automatically opened, when solvent heat release was unusually high, to reduce the temperature requirement for preheated emission. Thus, this damper functioned to maintain a minimum burner fuel requirement, restrict the maximum operating temperature and achieve good incineration efficiency. A savings of 54% in fuel costs was achieved over what fume incineration without heat recovery would have cost. Equally important, a potential odor and pollution problem was circumvented. Tests showed that the incineration system operated satisfactorily and met guarantee requirements of Rule 66 of the Los Angeles Air Pollution Control District.

56987 **APTIC NO. 81304**

SULFUR SCRUBBER LOGS ONE YEAR OF TROUBLE-FREE DUTY. *Elec. Light Power, vol. 1974:16, Nov. 1974.*

The trouble-free operation of a Wellman-Lord stack gas desulfurization system on a 220-megawatt unit at the Chubu Electric Power Company s Nishi-Nagoya Station is described. Since May 1973 the desulfurizer has demonstrated near perfect availability, reducing the sulfur content of the stack gas from 1600 ppmv to less than 150 ppmv. The power generating unit burns 3% sulfur residual oil. The Nishi-Nagoya station is a cycling unit with wide daily swings and is fully representative of demanding utility duty. The plant operates 100% during the day on weekdays and turns down to a maximum of 33% each night. The desulfurization system is a regenerative type, converting sulfur dioxide to marketable sulfuric acid (98%).

56988 **APTIC NO. 81324**

REMOVAL TECHNOLOGY HINGES ON BASIC CHEMISTRY. *Power, 118(9):S.6-S.24, Sept. 1974.*

Removal of sulfur dioxide from stack gases is discussed, including wet removal systems, throwaway processes, a limestone system, basic system circuitry, system mechanics, closing the loop, scrubber system design, impact of fly ash content, scrubber selection, mist eliminators, stack gas reheat, and the choice between lime and limestone. A limestone scrubber system with two venturi/absorber scrubber modules is described. The double alkali process, in which lime is added after scrubbing, is also described. Magnesium oxide absorbs SO2 in magnesia scrubbing; both are recovered for use. Catalytic oxidation converts SO2 to sulfuric acid, which is subsequently condensed. The Wellman-Lord process involves removal of SO2 and reduction to elemental sulfur. The citrate process uses a citrate absorbent to remove SO2, producing sulfur. A dry adsorption process uses char as the adsorbent medium. Accurate monitoring and sensitive controls are crucial to effective operation. The functions of control loops in limestone scrubbing systems are listed. A flow measurement subsystem for catalytic oxidation is discussed. Devices for monitoring stack gas SO2 are discussed. A monitoring system beams light across the stack to an analyzer. Ambinet ground level SO2 monitoring is also discussed. Monitoring pH is crucial to minimizing scale formation within the scrubber. Plugging occurs in mist eliminators and wet/dry interfaces in scrubbers. To reduce the tendency toward scalling, tight pH control is the best solution. Wet scrubbing systems have energy requirements from pumping and fan losses. Certain parts of wet scrubbers require acid resistant materials. Sludge removal schemes are outlined. Chemical fixation processes have also been developed and refined. Several methods of reducing capital costs are offered. Costs pose a more difficult problem for industry than for utilities.

1973

56989 **APTIC NO. 81031**

Atsukawa, M.

DEVELOPMENT OF FLUE GAS DESULFURIZING PROCESSES. *Text in Japanese. Mitsubishi Juko Giho (Mitsubishi Heavy Ind. Tech. Rev.), 10(5):44-51, 1973.*

The development of flue gas desulfurizing processes at Mitsubishi Heavy Industries is described. The exhaust gas desulfurizing techniques include: the DAP-Mv process (dry method), Mitsubishi lime gypsum process (wet method), the soda method, and the ammonia method. The operation of a prototype Mitsubishi lime-gypsum process plant (100,000 N cu m/hr gas treatment volume) is described.

56990 **APTIC NO. 81055**

Atsukawa, M.

BASIC STUDIES ON THE NITROGEN OXIDES REMOVAL PROCESS FROM FLUE GASES. *Text in Japanese. Mitsubishi Juko Giho (Mitsubishi Heavy Ind. Tech. Rev.), 10(5):663-672, Sept. 1973. 17 refs.*

Basic studies of nitrogen oxides removal from flue gases are described. A catalytic reduction process is described which is mainly for flue gas from gas-fired boilers. The NOx is catalytically reduced to nitrogen by hydrocarbons or ammonia. A wet scrubbing process is described that is mainly used for the flue gas from oil-fired boilers and various other waste gases containing NOx. In the scrubbing process, NOx removal is most effective if the flue gas is first oxidized and then absorbed by water or alkaline solution.

56991 **APTIC NO. 81048**

Bauer, Elmer J., Barbara T. Reagor, and Charles A. Russell

USE OF PARTICLE COUNTS FOR FILTER EVALUATION. *ASHRAE (Am. Soc. Heating Refrig. Air Cond. Engrs.) J., 15(10):53-59, Oct. 1973. 16 refs.*

Particle count methods were used with a test duct to evaluate filter performance. A method of cycling between up and downstream particle counts was used to obtain enough count pairs to reach statistically significant values. Good data can be obtained for high efficiency filters over the range of about 0.4 to 4.0 micron. Data are also quite good for medium efficiency filters if a fairly large total count is obtained. Data are more erratic for primary or throwaway types, because of low efficiencies against fine particles which render values more sensitive to rapid particle concentration change and because of lower total counts associated with larger particle sizes, which give rise to poorer statistical averages. Generally, the system of cyclic 1 min sampling upstream and a downstream with a 1 min adjustment time between counts, gives fairly good statistical data from which to determine the efficiency of a filter, in spite of a rapidly varying background count and distribution. (Author abstract modified)

56992 **APTIC NO. 74602**

Gockel, J. L.

AN EVALUATION OF THE EFFECTIVENESS OF THE AUTOMOBILE ENGINE ADJUSTMENTS TO REDUCE EXHAUST EMISSIONS AND AN EVALUATION OF THE TRAINING REQUIRED TO DEVELOP PERSONNEL COMPETENT TO MAKE THE ADJUSTMENTS. *Clean Air Research Co., Pico Rivera, Calif., California Air Resources Board Contract ARB-654, Proj. ARB-2- 182-5, Rept. ARB-R-654-73-18, 271p., June 22, 1973. 6 refs.*

NTIS: PB 237-040

Two approaches for the control of exhaust emissions from used vehicles are described. The first approach involved the upgrading of Class A stations with exhaust analyzers and the training of Class A mechanics to perform low-emission tune-ups. Engines were reduced to their practical minimum pollution capability (MPC). These MPC tune-ups were completed on 300 vehicles representative of the 1957-1970 California vehicle population. Hydrocarbon and carbon monoxide emissions were reduced by 36.7% and 35.2% respectively. Exhaust oxides of nitrogen increased 5.6%. The average cost was $27.40. Fuel consumption was reduced by 5.0%. Interviews with the vehicle owners revealed that 54% of the vehicles performed better, 15% worse, and 31% with no change. The second approach involved the vacuum spark advance disconnection (VSAD) on engines for NOx control. Vehicle owners could not distinguish between real and dummy VSAD kits when no other work was done on their engines. The VSAD, combined with the lean tuning in the MPC tune-up, produced a change in drivability unacceptable to one of five owners. (Author abstract modified)

56993 **APTIC NO. 81417**

Maubon, A.

TECHNICAL AND ECONOMICAL CONSIDERATIONS OF THE IRSID/CAFL OXYGEN CONVERTER GAS RECOVERY SYSTEM. *Iron Steel Engr., 50(9):87-97, Sept. 1973.*

Waste gases from all BOF converters have been burned at the mouth of the vessel with large amounts of excess air until 1961. It was assumed that an air factor at least equal to 2 was necessary to prevent explosions. An unburnt off-gas collection system was developed in 1960 and tests were run on a pilot plant. Results from the process are quite satisfactory. The metallic yield is increased by about 1% when compared with a conventional system. Improvements in collection skirts, adjustment, construction, and the gas cleaning plant are described. A hood and stack of water jacket construction can be used. Construction and maintenance of the water jacket are discussed. At first a low-pressure drop cleaning system with multi venturi scrubbers was selected to keep power costs low. Because of more stringent gas cleaning requirements, high-pressure drop systems using one or several adjustable throat venturi s are now in operation or under construction. Safety requirements are discussed. The conditions which must be fulfilled to produce the necessary inert gas buffer between the combustible gases and the air are discussed. Combustion and noncombustion processes are compared in terms of type of gas cleaning system used and their economics. Comparison is difficult because of the variations possible in the design of the hood, the stack, and the dust removal system. Recovered gas can be mixed with other gases of low calorific value and used in the soaking pits. Costs and savings associated with gas recovery are estimated.

1972

56994 **APTIC NO. 72965**

Achorn, Frank and Jim Barber

BULK BLENDERS. ENVIRONMENTAL CONTROL AND OSHA. *Fert. Prog., vol. 1972:12p., Sept.-Oct. and Nov.-Dec. 1972.*

Dust-control practices for bulk blend fertilizer production are reviewed. Close control of granule size can reduce dust emssions from handling and mixing of fertilizer materials. Granular fertilizers can be treated with oils or liquid fertilizer to make powdered coating agents adhere to the particles, thus preventing dust emission during fertilizer blending. Fugitive dust resulting from the transport of materials can be minimized by the installation of ventilating hoods over conveyors and like. The exhaust gas can then be treated with a wet scrubber or a bag filter. A ventilation pick-up velocity of 250-300 ft/min is efficient for dust collection without fertilizer pick-up. The conveying velocity of the ventilation system must be somewhat higher than the usually recommended 3500 ft/min since fertilizer materials are often hygroscopic. Chemical laboratory hoods are recommended for processes where pesticides are added to fertilizers. A separate ventilation system should also be provided for pesticide dusts.

56995 **APTIC NO. 74227**

Seabrook, Henry H. and Bernard P. Breen

A PRACTICAL APPROACH TO NOX REDUCTION IN UTILITY BOILERS. *Preprint, 9p., 1972. 2 refs. (Presented at the American Power Conference, Annual Meeting, 33rd, Chicago, Ill., April 18-20, 1972.)*

Methods for reducing nitrogen oxide formation in large utility boilers are reviewed, with particular emphasis on reducing flame temperature by off-stoichiometric combustion. Field tests showed reductions of up to 73% on gas-fired units and up to 57% on oil-fired units when off-stoichiometric firing was employed with low excess air. Nitrogen oxide reductions related solely to combustion air temperature were approximately 5%. Casing leakage was reduced to a minimum to avoid oxygen negating the effect of off-stoichiometric combustion. Other control methods such as additional steam through the atomizer and air preheat lowering showed only marginal NOx reductions.

1970

56996 **APTIC NO. 72966**

Slack, A. V.

ABSORPTION OF SULFUR DIOXIDE IN LIMESTONE SLURRY: SMALL-FACE TESTS AT TVA. *Preprint, National Air Pollution Control Administration, 27p., 1970. (Presented at the International Symposium on Lime/Limestone Scrubbing for SO2 Control, Pensacola, Fla., March 16-20, 1970.)*

A status report of Tennessee Valley Authority pilot tests with a limestone slurry scrubbing system is presented. Both adequate scrubbing efficiency and absorbent utilization appear obtainable with limestone slurry, and the process offers several advantages over limestone injection into the boiler. There is some indication, however, that more scrubbing stages, or longer retention time in the scrubber, is required as compared to boiler limestone injection. The main question that remains unanswered is the liquor rate required; this can only be answered by larger scale tests than those performed thus far. Slurry recycle rate must be high enough to prevent plugging and give good scrubbing efficiency; a decrease from 9 l/min to 5 l/min reduces sulfur dioxide removal by about 15%. The liquor gas ratio at the 9 l/min rate is over 400 gal/mcf as compared with 40 gal/mcf or less in usual commercial practice. More research is required before the technical feasibility and economic acceptability of limestone slurry scrubbing can be established.

1954

56997 **APTIC NO. 74028**

Good, C. H., Jr.

FERROMANGANESE FURNACE FUMES CLEANED SUCCESSFULLY. *Iron Age, vol. 174:95-97, July 8, 1954.*

A system for controlling particulate fume emissions from a ferromanganese plant is described. The fume-containing gas (135,000 cfm) from two ferromanganese furnaces is first cooled by water sprays in five conditioning towers from 700 to 350 F. Gas leaving the top of each conditioning tower is then conducted to five dry, plate-type electrostatic precipitators. The pyrophoric properties of the fume are then utilized to increase the bulk density of the dust from 12 to 30 lb/cu ft by oxidation in five kilns. The hot burned dust is then discharged from the kilns into five water jacketed mixers where water is added to agglomerate and cool the dust. More water is then added and mulled into the dust to attain a proper consistency for briquetting.

1951

56998 **APTIC NO. 74029**

Bishop, C. A., A. H. Brisse, R. G. Thompson, C. R. Liebel, and W. A. Swaney

CLEANING FERROMANGANESE BLAST FURNACE GAS. *Iron Steel Engr., vol. 28:134-136, Aug. 1951.*

A pilot plant for the removal of fine particulate fume (0.1-1.0 micron) from ferromanganese blast furnace gas is described. The gas is both cooled and conditoned by passing it through a spray tower of sufficient capacity to cool the gas from an average temperature of 700 F to 350 F by evaporation of water in the tower. No water effluent is used in the spray tower. An electrostatic precipitator is used for the continuous removal of the fume particles which are subsequently exposed in a rotary kiln to air for oxidation. The fume is finally briquetted by mixing with water. Stack effluent loadings are about 0.05 grains/standard cu ft at the outlet of the pilot plant.

MEASUREMENT METHODS

1976

56999 **APTIC NO. 81439**

Anderson, Paul L.

DEVELOPMENT OF A CENTRIFUGE FOR SOURCE SAMPLING TO DETERMINE PARTICLE SIZE DISTRIBUTION. *Environ. Sci. Technol., 10(2):145-150, Feb. 1976. 6 refs.*

A small centrifuge source-aerosol sampler with a spectral calibration range of from 0.16-3 micron is described. The sampler includes multi-orifice cascade impactor plants ahead of the centrifuge to process coarse particulates. The centrifuge is thermally protected and small enough to be used for some instack sampling applications. The application of the sampler to the collection of aerosols before and after a fluid bed reactor baghouse on the experimental aluminum reduction cell is described. The fluid alumina bed appears to be an efficient collector of fine fume particles as well as hydrogen fluoride. Coarse fines (1-10 micron) predominately penetrate the baghouse as opposed to fines less than 1 micron in size. (Author abstract modified)

57000 **APTIC NO. 81605**

Aruga, T. and T. Igarashi

VERTICAL DISTRIBUTION OF OZONE: A NEW METHOD OF DETERMINATION USING SATELLITE MEASUREMENTS. *Appl. Opt., 15(1):261-272, Jan. 1976. 23 refs.*

A new method to determine the vertical distribution of atmospheric ozone over a wide range of altitude from the spectral measurement of backscattered solar ultraviolet radiation is proposed. An equation of radiative transfer is introduced in order to calculate the intensity of diffusely reflected solar ultraviolet radiation. The transmittance and the scattering function depend not only on the ozone density of a relevant sublayer but also on that of other sublayers. In the proposed method, the inversion equation is formulated in such a way that the change of diffusely reflected radiant intensity, caused by a minute change in the ozone density in each sublayer, is obtained exactly and directly at each wavelength used, and so that the relative change of ozone density is used instead of the absolute in order to determine the widely different ozone density. The equation is solved by an iterative procedure using the weight function obtained. The results of computer simulation indicate that the ozone distribution from the mesopause to the tropopause can be determined, and that although it is impossible to suggest exactly the complicated profile with fine structure, the smoothed ozone distribution and the total content can be determined with almost the same accuracy as the accuracies of measurement and theoretical calculation of the spectral intensity. (Author abstract modified)

57001 **APTIC NO. 81451**

Babu, S. V. and Y. V. Chalapati Rao

DETERMINATION OF THE COMPOSITION OF GAS MIXTURES AND STUDY OF CHEMICAL REACTIONS USING LASER INDUCED FLUORESCENCE. *Chem Phys. Letters, 37(2):249-252, Jan. 15, 1976. 18 refs.*

The possibility of using infrared Q-switched laser induced fluorescence to determine the composition of a gas mixture both when it is fixed and when it varies with time is discussed. The method presently appears applicable to stable molecules, e.g., several species of hydrocarbons. Since laser induced fluoresence can be relatively intense, this method is potentially quite accurate even at low temperatures. Fast reactions can also be studied because the response time of the detectors and associated electronics can be as low as a few nanoseconds. Even nonfluorescing gases can be followed using the method if the required accuracy is less than or equal to about 5% and the gases are not varying with time.

57002 **APTIC NO. 81194**

Breuer, Hans

THE FINE DUST LIGHTSCATTERING PHOTOMETER TM DIGITAL. *(Das Feinstaub-Streulichtphotometer TM digital). Text in German. Staub, Reinhaltung Luft, 36(1):6-10, Jan. 1976. 9 refs.*

A lightscattering photometer was designed to measure only the scattered light due to respirable dust under an angle of about 70 deg, using monochromatic primary light of a wavelength of 0.94 micrometer, without pre-selection of the scattered dusts. The measured values can be registered digitally or transmitted to a recorder. Studies in the lab and in coal mines indicate that the new Tyndallometer yields precise values for the mass of respirable dust. The TBF 50 was used for comparison measurements.

57003 **APTIC NO. 81376**

Criss, J. W.

PARTICLE SIZE AND COMPOSITION EFFECTS IN X-RAY FLUORESCENCE ANALYSIS OF POLLUTION SAMPLES. *Anal. Chem., 48(1):179-186, Jan. 1976. 15 refs.*

The effect of particle size and composition in X-ray fluorescence analysis of pollution samples was investigated. Emitted X-ray intensity was lower for large, dense particles than for the same mass of small, light ones. This effect often was negligible for submicrometer particles, but could range up to a factor-of-10 error for 10 micron particles. A simple empirical correction factor is proposed, namely (1 + ba) sq, where a is the particle diameter and b is a coefficient that depends on particle composition and experimental conditions. A table of values for b is provided for the determination of 48 different elements in 200 compounds, using either a chromium or tungsten target X-ray tube. Formulas are presented for calculation calculating b in other situations. (Author abstract modified)

57004 **APTIC NO. 81498**

Flamm, Daniel L. and Robert E. James

ABSORPTION EFFICIENCIES FOR SOURCE SAMPLING OF HYDROGEN SULFIDE. *Environ. Sci. Technol., 10(2):159-162, Feb. 1976. 13 refs.*

The absorption efficiencies of solutions of zinc acetate, cadmium hydroxide, and cadmium sulfate solutions for the source sampling of hydrogen sulfide were investigated. A Smith-Greenburg impinger with 200 ml of each absorbing solution was used at a sampling rate of from 3-15 l/min for H2S concentrations of 100-800 ppm. Absorbent concentrations of 0.016 and 0.091 M were used. The collection period was 15 min. Zinc acetate was the most efficient absorbent; a 0.091 M solution at 21 C ensured that more than 90% of the H2S was absorbed at sampling rates up to 10 l/min. The experimental observations were not predicted by the theory of Calvert and Workman, possibly due to the neglect of a distribution in bubble sizes or the presence of precipitate at the surface of bubbles. (Author abstract modified)

57005 **APTIC NO. 81445**

Idso, S. B.

COMPLEXITIES OF SURFACE ALBEDO DETERMINATIONS DURING DUSTSTORMS. *Atmos. Environ., 10(1):5-7, 1976. 11 refs.*

Surface albedo measurements conducted prior to and following the arrival of duststorms at Phoenix, Arizona showed no differences that were attributable to the effects of airborne or deposited dust. Kipp solarimeters registered large variations in their outputs during these times: however, these perturbations appeared to be due to some type of temperature shock induced by the rapid change in air temperature that occurred with the passage of the duststorm frontal boundary. Eppley and Lambda pyranometers were not susceptible to this type of erratic behavior. (Author abstract modified)

57006 **APTIC NO. 81499**

Maddalone, Ray F., Ronnie L. Thomas, and Philip W. West

MEASUREMENT OF SULFURIC ACID AEROSOL AND TOTAL SULFATE CONTENT OF AMBIENT AIR. *Environ. Sci. Technol., 10(2):162-168, Feb. 1976. 28 refs.*

A procedure for the measurement of sulfuric acid aerosol and total sulfate content of ambient air is described. The procedure involves the formation of permidylammonium sulfate and subsequent thermal decomposition to form quantitatively sulfur dioxide. The SO2 may be determined colorimetrically by the West-Gaeke procedure or by means of flame photometry. Airborne particulate samples are analyzed by isolating the sulfuric acid by microdiffusion, and total sulfate is determined by aqueous extraction of the particulate samples. A working range of 1-50 micrograms of sulfate can be handled conveniently, and the determination (excluding microdiffusion) requires only a few minutes. (Author abstract modified)

57007 **APTIC NO. 81623**

Mitchell, William J. and M. Rodney Midgett

MEANS TO EVALUATE PERFORMANCE OF STATIONARY SOURCE TEST METHODS. *Environ. Sci. Technol., 10(1):85-88, Jan. 1976. 3 refs.*

Two sampling arrangements are described that allow four independent stationary source sampling trains to sample simultaneously at essentially the same point in the stack. Results obtained with these sampling arrangements during field tests using the Environmental Protection Agency particulate sampling train are presented. Either arrangement can be a useful means to determine the agreement that might be expected between similar stationary source sampling trains. Further, these sampling probe arrangements might be a controversial means to evaluate the relative performance capabilities of dissimilar stationary source test methods or sampling trains applicable to measuring the same pollutant. They should also be useful for determining the effect that changing such things as sampling rate, probe or filter temperature, type of probe material, or number of or location of impingers or filters might have on the performance of a certain sampling train. (Author abstract modified)

57008 **APTIC NO. 81407**

Pierce, Ronald C. and Morris Katz

CHROMATOGRAPHIC ISOLATION AND SPECTRAL ANALYSIS OF POLYCYCLIC QUINONES APPLICATION TO AIR POLLUTION ANALYSIS. *Environ. Sci. Technol., 10(1):45-51, Jan. 1976. 29 refs.*

A method is described for the analysis of polycyclic quinones (PQu) derived from polynuclear aromatic hydrocarbons (PAH), involving resolution by column and thin-layer chromatography and spectral analysis by ultraviolet, visible and fluorescence spectrophotometry, and mass spectrometry. Isomeric PQu was isolated on silica gel columns and polyamide or magnesium hydroxide thin-layer plates. Applications of the technique to photooxidation and air pollution studies are reported. Benzo(a)pyrene-6,12-quinone, 9,10-anthraquinone, benzo(a)pyrene-1,6-quinone, benzo(a)pyrene-3,6-quinone, and dibenzo(b, def)chrysene-7,14-quinone were identified in samples of suspended particulate matter collected in Toronto. Because of the very low concentrations of PQu in the atmosphere, the collected quinones were reduced to the parent hydrocarbon prior to fluorescence analysis so that quantitative analyses could be performed. Estimations are reported of the monthly distribution in the amount of benzene soluble fraction, quinone fraction, benzo(a)pyrene, benz(a)anthracene, benzo(a)pyrene-quinone (BaP-Qu), benz(a)anthracene-quinone (BaA-Qu), and benzanthrone in suspended particulate matter. Seasonal variations were discovered in the content of benzene soluble fraction, polycyclic quinone fraction, (BaP-Qu) and benzanthrone. The variation is related to the ease of photooxidation, and seasonal variations in fuel-burning practices.

57009 **APTIC NO. 81378**

Wang, Charles C., L. I. Davis, Jr., C. H. Wu, and S. Japar

LASER-INDUCED DISSOCIATION OF OZONE AND RESONANCE FLUORESCENCE OF OH IN AMBIENT AIR. *Appl. Phys. Letters, 28(1):14-16, Jan. 1, 1976. 10 refs.*

The measurement of hydroxyl (OH) concentrations in air at ground level was investigated using resonance fluorescence. Ambient ozone leads to significant interference because of OH formation due to laser induced dissociation of O3. This sets an upper limit for the intensity that can be used to excite the resonance fluorescence of OH ambient air. The amount of OH generated is reduced by using reduced intensity of excitation through the use of a cylindrical lens for focusing, and by using an exciting laser with shorter pulse duration, such as nitrogen laser pumped dye laser.

1975

57010 **APTIC NO. 81370**

Beltzer, Morton

MEASUREMENT OF VEHICLE PARTICULATE EMISSIONS. *Environ. Health Perspect., vol. 10:121-130, April 1975. 5 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., Apil 17-19, 1974.)*

A constant volume sampler compatible auto exhaust particulate sampling system was built which samples exhaust isokinetically at constant temperature. The system design is described, including the diluent air preparation system and the flow development tunnel, the exhaust injection system, the isokinetic probe, the particulate collecting stage, mixing of exhaust and diluent air, tunnel sampling losses, equivalent emission rates with parallel filters, and temperature maintenance at the particulate collection stage. This system yields internally consistent results and is capable of frequent and convenient operations. (Author abstract modified)

57011 **APTIC NO. 81108**

Bennert, Wulf and Irene Grundmann

THE INFLUENCE OF ELECTRONIC NOISE AT DIGITAL PARTICLE SIZE ANALYSIS. *(Der Einfluss des elektronischen Rauschens bei digitaler Teilchengroesenanalyse). Text in German. Freiberger Forschungsh. A, vol. 531:65-79, 1975. 7 refs.*

Digital particle size analyzers, e.g., those using a secondary electron multiplier, furnish not only signal pulses but also the pulse resulting from the superposition of the signal pulse on the background noise, which may considerably alter the size distribution of the pulses. As a result, a falsified distribution density is obtained which is a function of the real distribution density. The real distribution density can be computer from the falsified distribution density by means of an analog computer from a formula presented in this paper. Also, as a result of the background noise, a lower limit of detection can be stated with reference only to the probability of particle recording.

57012 **APTIC NO. 76748**

Bigg, E. K.

STRATOSPHERIC PARTICLES. *J. Atmospheric Sci., 32(5):910-917, May 1975. 9 refs.*

The use of impactors for obtaining information on stratospheric particles not provided by either optical counting or high-volume filter samples was investigated. Particles were collected from the stratosphere by impaction onto specially treated electron microscope screens during six balloon flights over Wyoming during 1972. The submicron diameter particles were predominantly ammonium sulfate near the tropopause and sulfuric acid at higher altitudes, though the ratio of acid to non-acid particles decreased rapidly with particle diameter, even at the higher altitudes. The acid particles were often in a frozen state, and aggregates joined in irregular groups were often observed near 20 km altitude. Number concentrations were usually in reasonable agreement with those found by an optical counter carried on the same flight; however, conspicuously lower concentrations were found near 20 km on two occasions. This appeared to be due to incomplete collection of frozen aggregates. Size distributions suggested a relatively large number of particles smaller than 0.2 micron diameter near the tropopause but few above about 20 km. The distribution of mass with particle diameter implied that an impactor may sometimes underestimate the total mass. (Author abstract modified)

57013 **APTIC NO. 81389**

Cadle, Richard D., Gerhard Langer, J. B. Haberl, A. Hogan, James M. Rosen, William A. Seclacek, and J. Wegrzyn

A COMPARISION OF THE LANGER, ROSEN, NOLAN-POLLAK AND SANDS CONDENSATION NUCLEUS COUNTERS. *J. Appl. Meteorol., 14(8):1566- 1571, Dec. 1975. 10 refs.*

Aerosol concentrations measured by four different types of condensation nucleus counters were compared. Three of the counters, the Langer, Rosen, and General Electric SANDS instruments were used to measure Aitken nuclei concentrations in the upper troposphere and the stratosphere, and the fourth, the Pollak counter, was calibrated to serve as a standard. The SANDS and Rosen instruments generally indicated concentrations within + or - 20% of the Pollak counter, except when extremely small particles were generated. There was good agreement among the field instruments. (Author conclusions modified)

57014 **APTIC NO. 81381**

Chan, P. W., O. Apichatonon, and C. Y. She

PARTICLE SIZING OF ARC SMOKES BY FORWARD LIGHT SCATTERING. *Environ. Letters, 10(1):69-76, 1975. 8 refs.*

The size distribution of metallic electric arc smoke particulate systems was investigated using the polarization ratio and the two angle intensity ratio methods, with small forward scattering angles. Results are presented for carbon, tungsten, and aluminum arc smokes and are fairly satisfactory or agree with each other within experimental error (+ or - 30%). Both methods are simple to apply and may be applied to size other types of particulate systems. Both techniques fail for smaller particle sizes. (Author conclusions modified)

57015 **APTIC NO. 81620**

Constantinescu, M. and T. Stadnicov

ANALYSIS BY X-RAY FLUORESCENCE INDUCED BY CHARGED PARTICLES. *(Analiza prin fluorescenta de raze x induse de particule incarcate). Text in Rumanian. Studii Cercet. Fiz., 27(9): 861-873, 1975. 61 refs.*

One of the most recent additions to the traditional X-ray fluorescence analysis method is discussed. It is particularly sensitive and rapid. This method uses a beam of charged particles for the excitation of K, L, or M X-rays, together with recently refined high resolution detection techniques. Quantities of the order of 10 to the -12th power g can be determined in environmental pollution research and biological tests. (Author abstract)

57016 **APTIC NO. 81281**

Corte, G. L., R. S. Thomas, R. C. Lao, and L. Dubois

THE PREPARATION OF SILVER ABSORBERS FOR SAMPLING AIRBORNE MERCURY. *Mikrochim. Acta, vol. 1975:533-538, 1975. 1 ref.*

The preparation of silver absorbers for sampling airborne mercury is described. The absorbers are made of borosilicate glass with a single piece of silver gauze sealed in. The silver gauze is 30-60 mesh material folded into a double cylinder and heated to 800 C. Each absorber is numbered uniquely in serial fashion with three digit numbers, consisting of heat resistant colored ceramic fused to the glass envelope. A piece of vinyl tubing, connecting the two side arms, seals the absorber for contamination-free storage and transportation. Typical calibration results for 20 individual absorbers are tabulated.

57017 **APTIC NO. 77518**

Crecelius, Hans-Joachim and Walter Forwerg

THE SORPTION OF ORGANIC COMPOUNDS ON SILICA GEL FOR DETERMINATION OF EMISSIONS. *(Die Sorption organischer Verbindungen an Silikagel zur Bestimmung von Emissionen). Text in German. Staub, Reinhaltung Luft, 35(9):330-333, Sept. 1975. 9 refs.*

The determination of the retention volumes of several organic compounds and the study of the retention volumes as a function of the process parameters provide information on the sorption capacities of silica gels. A study was made of the retention volumes of benzene as a function of the following parameters: humidity of the sample, concentration of the test components, layer thickness of the gel in the sampling tube, desorption temperature, and number of desorptions per sampling tube. Between retention volume and boiling point of the organic compounds tested there was a functional relationship which permitted a rough estimate to be made of the retention volumes of other organic compounds under certain conditions, one of them being comparable polarity.

57018 **APTIC NO. 81125**

Davies, I. and P. W. Polfreman

CORROSION OF GAS TURBINES BO SODIUM IN DISTILLATE FUEL OIL. *J. Inst. Fuel, 48(394):16-20, March 1975. 6 refs.*

The hot corrosion of gas turbine HP blades at a CEGB power station was directly associated with the sodium content of the distillate fuel oil. In a 2700 hour trial using fuel with reduced sodium content, corrosion was eliminated. Other investigations failed to show any association between corrosion and airborne sodium or compressor cleaning methods. The association between corrosion and sodium fuel was only revealed when a reliable method of fuel sampling and development had been developed. A method for the determination of sodium in air at a power station is described in which atmospheric solids are collected on membrane filters. The membrane filters were soaked in deionized water for 7 days, which was sufficient to remove about 97% of the Na. Integrating gas meters were used to obtain a more positive measurement of the volume samples. Examination of the samples with an electron probe microanalyzer showed that while most of the particles below 1 micron consisted of sodium chloride, the large particles up to 100 micron contained potassium sulfate or probably double sulfates of the type $K_x(NH_4)_ySO_4$.

57019 **APTIC NO. 81357**

DeCormis, L.

FLUORATED ATMOSPHERIC POLLUTION. *(La pollution atmospherique fluoree). Text in French. Pollut. Atmos (Paris), 17(65):10-13, Jan.-March 1975.*

Analytical methods currently used to identify and measure the rate of atmospheric pollution by the fluorated by-products are reviewed. Statistical methods express cumulative pollution throughout a determined period through an impregnated support. The unit adopted is arbitrary (microgram/d sq m/day). Dynamic methods measure a mean pollution (in microgram/cu m) throughout the sampling period which can vary from a few hours to a few days according to the intensity of the pollution. There is no technique to separate with certainty gaseous fluorated by-products (hydrogen fluoride) and particle fluorides, whose size is usually submicronic.

57020 **APTIC NO. 81377**

Della Fiorentina, H., F. De Wiest, and J. De Graeve

INFRARED SPECTROMETRIC DETERMINATION OF NON-VOLATILE ORGANIC MATTER ADSORBED IN AIRBORNE PARTICLES. PART II -- FACTORS INFLUENCING THE ALIPHATIC INDEX. *(Determination par spectrometrie infrarouge de la matiere organique non volatile associee aux particules en suspension dans l air -- II. Facteurs influencant l indice aliphatique). Text in French. Atmos. Environ., 9(5):517- 522, May 1975. 7 refs.*

The infrared estimation of organic aliphatic material collected on glass fiber filters at commonly used air flow rates was investigated. The composition of this material, adsorbed on suspended matter varied greatly with the flow rate and duration of sampling. Most compounds with boiling temperatures lower than 300 C were progressively eliminated from the sample. When sampling lasted 24 hr or more, the composition of the sample was stabilized and standardization of the spectrophotometer response against a weighed amount of extract was quite satisfactory. The nature of the remaining heavy aliphatic substances gave little variability for different places and periods of the year.

57021 **APTIC NO. 73966**

Drake, Ronald L.

COLLECTION EFFICIENCY CALCULATIONS FOR AN ASPIRATING, AXISYMMETRIC PROBE FOR MEASURING ATMOSPHERIC AEROSOLS. *In: Pacific Northwest Laboratory Annual Report for 1974 to the USAEC Division of Biomedical and Environmental Research. Part 3: Atmospheric Sciences. Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., Rept. UC-11, p. 25-28, Feb. 1975. 3 refs.*

NTIS: BNWL-1950 PT3

The calculation of collection efficiency for an aspirating, axisymmetric probe used for airborne measurements of atmospheric aerosols is described. The collection efficiency of the probe is defined as the ratio of the area in some vertical plane in front of the probe through which pass only those particles that eventually enter the probe to the area of the sampling hole. A schematic diagram illustrating the maximum collection efficiency of the probe is presented.

57022 **APTIC NO. 81482**

Dravnieks, Andrew

METHOD OF DETECTING ODORS AND APPARATUS THEREFOR. *(Fats and Proteins Research Foundation, Inc., Des Plaines, Ill.(U. S. Pat. 3,902,851. 6p., Sept. 2, 1975. 4 refs. (Appl. Jan. 9, 1974, 11 claims).*

A new and improved olfactometer for enhancing the smell capabilities of the tester is described. Other methods and devices for dilution result in time consuming test procedures and/or permit interaction between the panel leader and the individual panelists, allowing the transmission of clues. The apparatus consists of a container for holding a sample of the material to be tested, a pump for withdrawing portions of the sample, and a device for presenting the sample material to the nose of a test panel member. The apparatus also includes a second pump for delivering samples of an odorless material for comparison with the sample material. (Author abstract modified)

57023 **APTIC NO. 81151**

Essers, K. H., M. Hein, and G. Hipler

HCL DETERMINATION IN FLUE GASES WITH A CONTINUOUS MEASURING METHOD. *(HCL-Bestimmung in Rauchgasen mit einem kontinuierlichen Messverfahren). Text in German. Wasser Luft Betrieb, 19(11):650, 1975.*

An indirect method for the continuous automatic measurement of hydrochloric acid concentrations in the air is described. A preset HCl concentration is maintained in a measuring cell by a chloride-sensitive electrode. The introduction of HCl- containing gases or air causes a change in the electrode potential, which causes the chloride-sensitive electrode to restore the preset concentration by dilution with distilled water. The water consumption is a measure of the HCl concentration in the gas. By the use of adequate ion-sensitive electrodes, the instrument is also suitable for the measurement of other components.

57024 **APTIC NO. 78647**

Forney, Larry J. and John F. McCoy

A FLOW-THROUGH ELECTRODE UNIT FOR MEASUREMENT OF PARTICULATE ATMOSPHERIC NITRATE. *Analyst, 100(1188):157-162, March 1975. 12 refs.*

The design and operation of a flow-through electrode unit for the measurement of particulate atmospheric nitrate are described. The unit houses an ion-selective nitrate electrode and fluoride reference electrodes. It provides temperature control to within + or - 0.5 C, sensitive regulation of the solution content (41 + or - 1.5 ml), and optimum liquid circulation, while minimizing liquid volume. The unit behaves as an ideal well stirred vessel according to the results of preliminary tests at 38.5 C. Atmospheric nitrate particulate analysis can be achieved by utilization of the device in conjunction with a commercially available aerosol collection device. (Author abstract modified)

57025 **APTIC NO. 81225**

Fukasawa, Tsutomu

PROBLEMS IN ENVIRONMENTAL ANALYTICAL CHEMISTRY AND APPLICATION OF X-RAY FLUORESCENCE METHOD. *(Kankyo shiryo bunseki ni okeru mondaiten to keiko X-sen ho no oyo). Text in Japanese. Preprint, Chemical Society of Japan, Tokyo, p. 52-55, 1975. (Presented at the X-Ray Analytical Lecture Meeting, 12th, Fukuoka, Japan, Oct. 17-18, 1975, Paper 2K05.)*

Problems and characteristics of environmental analytical chemistry are discussed. Application of fluorescence X-ray analysis to environmental sampling is described. Points to be considered in environmental analytical chemistry include trace analysis problems; large number of test samples to be analyzed for a multitude of components; analyses to be performed by many people in many places; determination of exact values, which determine legal and social actions; and desirability of keeping test samples for future use. Fluorescence X-ray analysis meets the requirements posed by the aforementioned 5 points. Improvements in fluorescence X-ray equipment, such as introduction of semi-conductor detectors and multi-channel wave height analyzers, have increased sensitivity and analytical capability. However, joing experiments performed on different equipment at different locations showed high scatter in the results, probably due to differences in manufacturing procedures and chemical analysis techniques for the standard samples.

57026 **APTIC NO. 78210**

Glidewell, M. D.

DEVELOPMENT OF AN EFFECTIVE ODORANT FOR NATURAL GAS. *Gas Eng. Manage., J. Inst. Gas Engrs., vol. 15:241-246, Aug. 1975. 6 refs. (Presented at the London and Southern Junior Gas Association, Feb. 15, 1974.)*

A method of assessing odor intensity in odorized natural gas using an odor intensity scale is described. The concept of the scale is based on a law of human sensation, the Weber-Fechner Law, which states that for any given odorant the intensity of the odor sensation is proportional to the logarithm of the odorant concentration. Observers, who have been taught to recognize various levels of odor intensity on a scale of 0-5% olfactory degrees, assess the odor intensity of a 1% gas in air mixture. The assessments are repeated with 0.3% gas in the air, and then again with 1% gas in air. The results for the different observers at each concentration are averaged. The odorant, Odorant BE, a blend of tertiary butyl mercaptan with ethyl mercaptan and diethyl sulfide, is being considered for a universal odorant in British natural gas.

57027 **APTIC NO. 81214**

Graziotti, R. and J. C. Scholle

GRANULOMETRIC MEASURES IN MULTIPHASIC FLOW BY MEANS OF AN INERTIA IMPACTOR. APPLICATIONS IN THE FIELD OF COMBUSTION. *Riv. Combust., 29(7-8):309-320, July-Aug. 1975. 5 refs. (Presented at the Italian Flame Days, Sanremo, Italy, April 10-11, 1975.)*

An instrumentation system was developed for collecting information on the particles circulating in a flow. The information to be determined when studying a multiphasic flow (granulometric structure, state, and shape) and the difficulties involved are discussed. The principle of captation by impaction of the particles is introduced. Application to probes in a blast furnace pipe, a duct of a city heating station, a unit for air drying with sulfuric acid, steam generators, and characterization of a sprayed liquid jet is discussed. The impactor used, the method of utilization of the impaction films and the results obtained are described for each application. The advantages and drawbacks of the method are discussed. (Author abstract modified)

57028 **APTIC NO. 78492**

Hanson, R. K., W. L. Flower, J. P. Monat, and C. H. Kruger

DECOMPOSITION OF NO STUDIED BY INFRARED EMISSION AND CO LASER ABSORPTION. *Preprint, Stanford Univ., Palo Alto, Calif., Mechanical Engineering Dept., 4p., 1975 (?). 5 refs.*

The potential of discretely tunable carbon monoxide lasers for absorption measurements of nitric oxide decomposition was assessed by comparing the laser data with infrared emission measurements at 5.3 micron. The laser data were obtained behind incident shocks in NO-nitrous oxide-argon (or krypton) mixtures at temperatures between 2400 and 4100 K. Rate constants for dominant reactions were inferred from comparisons with computer simulations of the reactive flow. The peak value for NO occurred about 1 microsecond after shock arrival due to the initial formation of additional NO during N2O decomposition. The emission data at 1 microsecond were distorted by two nonideal effects, viz., NO vibrational relaxation and a slight transient interference from N2O emission. After the rapid decomposition of the initial N2O, the rate-limiting step for NO removal was the reaction between NO and atomic oxygen to give atomic nitrogen and molecular oxygen. Measured absorption coefficients were in the range of 50,000 to 110,000 sq cm/mol and decreased with increasing temperature. Good agreement was obtained between the laser and infrared measurements, serving to validate the laser absorption technique and providing some indication of the accuracy of the two methods.

57029 **APTIC NO. 74877**

Harada, K., K. Oishi, and K. Yasuda

LUMINESCENT ANALYSIS OF METAL BY GRIMM-LAMP. *(Gurimu ranpu ni yoru kinzoku no hakko bunseki). Text in Japanese. Preprint, Japan Society of Spectroscopy, Tokyo, 3p., 1975. 4 refs. (Presented at the Japan Society of Spectroscopy, Lecture Meeting, Tokyo, Japan, May 21-22, 1975.)*

The luminescent analysis of metals with a Grimm glow discharge lamp is discussed. Metal elements, scattered with argon ions, are introduced into an argon plasma (glow discharge plasma) to make it luminescent. Since scattering is utilized, there is very little thermal factor involved, and no separate distillation takes place. The spectrum is narrow; and since the discharge is stabilized, there is very good reproduction and high precision. Experiments were conducted with powdered chrome, using copper as a diluent. About 2-5 g of copper powder (325 mesh), and 0.05-0.5 g chrome powder (200 mesh) were mixed, pressurized, and molded. The pellets were used as samples for the measurement. The chrome resonance line was linear at low concentrations but at higher concentrations the line warped due to self-absorption. However, this was corrected by using a non-resonance line at 2677.16A. The method may be applicable to the analysis of powder metals, substances which are not electrically conductive, or dust in the atmosphere.

57030 **APTIC NO. 81247**

Hasegawa, Takashi, Tomohiko Ishiguro, Yoshihiro Shigeta, and Nanyo Okabayashi

ATMOSPHERIC STYRENE ANALYSIS BY GAS CHROMATOGRAPHY. *(Gasu kuromatogurafi ni yoru taikichu suchiren no bunseki). Text in Japanese. Preprint, Japan Society for Analytical Chemistry, Tokyo, p. 205, 1975. (Presented at the Japan Society for Analytical Chemistry, Lecture Meeting, 24th, Sapporo, Japan, Oct. 1-5, 1975. Paper 1D24.)*

Styrene analysis was studied by gas chromatography following its concentration on a concentration column without the use of coolant. About 0.6 g of TENAX GC (porous polymer beads) was used to fill an 18 cm by 5 mm Pyrex glass column and used to adsorb styrene. The styrene trapping efficiency by this column at 25 C was 100% for flow rates between 220 and 750 ml/min. An efficiency of 100% was also obtained when the concentration column was used at 80 C. The adsorbed styrene on the column was retained even 72 hr after the concentration. Upon the heating of the concentration column, the styrene was liberated and analyzed by gas chromatography using 5% SP-1200 with 1.75% Benton 34 on the Chromosorb W column. Using the concentration column, 500 ml of an indoor air sample of a factory was concentrated and analyzed by GC, which measured 13 ppm styrene for this sample.

57031 **APTIC NO. 81736**

Heijne, Leopold, Nicolaas Marinus Beckmans, Petrus Jacobus Poolman, and Ronald Karel Eijnthoven

GAS ANALYSIS APPARATUS. *(U. S. Philips Corp., New York) U. S. Pat. 3,907,657. 6p., Sept. 23, 1975. 10 refs. (Appl. Aug. 29, 1973, 16 claims).*

A partition method for measuring the concentration of a gaseous sample is described that requires no mechanically moving parts. A further advantage is that the filling time may be chosen so that the dimensions of the connecting means do not affect the measurement results. The method involves bringing a measuring space of known volume to the concentration level to be measured via a connecting means having a high transfer resistance. The gaseous component is then rapidly removed from the measuring space by means of a partition, forming part of a wall section of the measuring space in which ionic conduction takes place. The required charge which is applied to the partition is a measure of the concentration to be determined. (Author abstract modified)

57032 **APTIC NO. 81436**

Hilp, Manfred

THE SULFUR DETERMINATION IN ORGANIC SUBSTANCES BY SCHOENIGER. *(Zur Schwefelbestimmung in organischen Substanzen nach Schoeniger). Text in German. Chemiker-Ztg. (Heidelberg), 99(11):458-459, 1975. 14 refs.*

Improvements of Schoeniger s method for the determination of sulfur in organic substances is described. A modified version of the micro-flask apparatus Mikro K (by Heraeus) was used for combustion, after which the sulfur was converted into sulfuric acid with hydrogen peroxide. Titration was done after the addition of barium perchlorate, using Sulfonazo III indicator (2,7-bis-(2prime-sulfophenylazo) chromotropic acid) for titration. A light-box with fluorescent lamps was used to facilitate the recognition of the end-point.

57033 **APTIC NO. 81199**

Himi, Yasuji and Fumio Muramatsu

DETERMINATION OF METALS IN AIRBORNE DUST BY FLUORESCENT X-RAY SPECTROMETRY (I). FLUORESCENT XrRAY SPECTROMETRY USING STANDARD SAMPLES PREPARED BY VACUUM EVAPORATION FOR THE ANALYSIS OF AIRBORNE DUST COLLECTED ON GLASS FIBER FILTER. *(Keiko X-sen ni yoru taikichu no kinzoku seibun no sokutei (I). Shinku jochaku hyojun shiryo o mochiita fuyu baijin shiryo no keiko X-sen bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(3):135-142, 1975. 7 refs.*

Standard samples of metals iron, lead, manganese, vanadium, titanium, chromium, and nickel) for fluorescent X-ray spectrometry were prepared by vacuum evaporation on glass fiber filters. These standards were used to determine metal components in airborne dust, collected on glass fiber filters by the high volume air sampler. Calibration curves for the metals were linear (amount of metal on unit area of glass fiber filter vs. X-ray intensity). Quantitative determinations of metals deposited as standard samples, and comparative quantitative determinations for airborne dust samples were conducted by atomic absorption spectrophotometry. There was good agreement between the two methods. There is no interference from organic matter, free carbon, or from other metals (in trace concentrations usually present in the air). Blanks should be run on the metal content of the glass fiber filters. Lower limits of detectability of tested metals (micrograms/sq cm filter) were Fe (0.021), Pb (0.057), Mn (0.007), V (0.009), Ti (0.014), Cr (0.010), Ni (0.011). Experimental deviations (deviation %, average micrograms/sq cm filter) for the metals, from airborne dust samples, were: Fe (1.00%, 26.8); Pb (5.17%; 1.76); Mn (2.37%; 0.59); V (1.42%; 1.12); Ti (1.77%; 2.31); Cr (7.48%; 0.32); and Ni (7.29%; 0.19).

57034 **APTIC NO. 81337**

Himi, Yasuji

MEASUREMENT OF POLLUTANTS AND ITS PROBLEMS. *(Osen bushitsu no sokutei to mondaiten). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(2):29-35, Feb. 1975. 19 refs.*

Measurements of pollutant concentrations in stacks are mandatorily imposed by the Air Pollution Control Law. Measurement methods for particulates, sulfur oxides, and nitrogen oxides concentrations in flue gas and measurement methods for flue gas temperature, pressure, flow rate and flow quantity are reviewed with principles of measurement and discussion of problem points involved. The selection of measurement position and point and sampling methods are discussed with descriptions of sampling devices. The calculation method for pollutant emission quantity is also discussed.

57035 **APTIC NO. 81246**

Hiratsuka, Yutaka, Kenji Odajima, and Osamu Miyazawa

LOSS OF SO2, NO2, AND NO GAS IN SAMPLING PIPING. *(SO2, NO2, NO gasu no sanpuringu haikan ni okeru sonshitsu). Text in Japanese. Preprint, Japan Society for Analytical Chemistry, Tokyo, p. 53, 1975. (Presented at the Japan Society for Analytical Chemistry, Lecture Meeting, 24th, Sapporo, Japan, Oct. 1-5, 1975.)*

The sorption of sulfur dioxide, nitrogen dioxide, and nitric oxide by pipings of various materials was examined. A constant flow of 998 ppm SO2, 303 ppm NO2, and 315 ppm NO in nitrogen gas was passed through a 120 cm long piping, and the effluent concentration was continuously measured by an SO2 analyzer and a nitrogen oxides analyzer to give the concentration curve against time. Three different patterns were observed for the concentration curves. All of them initially gave decreased concentration with time due to the sorption of substances on the piping materials. After the sorption reached a maximum, all patterns started to return to the input gas concentration. One of the patterns returned to the input gas concentration smoothly. The second pattern did not return completely and remained in a lower concentration than the input gas concentration even if sufficient time was allowed. In the third pattern, higher concentration than the input gas concentration was observed after the initial concentration drop, and then the concentration returned to the input gas concentration. Both soft vinyl chloride pipe and polymethacrylate pipe belonged to the third pattern when NO2 gas was passed through them. Apparently the NO2 sorbed to the pipe material reacted with the condensed water to produce NO which was detected by the NOx analyzer. By using the concentration curve with teflon pipe as the standard, the sorption rates for soft vinyl chloride, 18-8 stainless steel, hard vinyl chloride, soft glass, silicon rubber, and polymethacrylate pipes were determined. The stainless steel pipe gave the best results. The gas sorption rates were 0.06, 0.013, and 0.0066 micrograms/sq cm for SO2, NO2, and NO, respectively.

57036 **APTIC NO. 78646**

Hollowell, Craig D., Ralph D. McLaughlin, and Jeffrey A. Stokes

CURRENT METHODS IN AIR QUALITY MEASUREMENTS AND MONITORING. *IEEE Trans. Nucl. Sci., NS-22(2):835-848, April 1975. 14 refs.*

Continuous and semi-continuous instrumentation currently commercially available for air oollution monitoring of the major pollutants for which national air quality standards have been established are reviewed. The most frequently used monitoring instrumentation for the major gaseous pollutants and physical characterization of particulates include: colorimetric analyzers for sulfur dioxide, nitrogen oxides, oxidants; chemiluminescent analyzers for NOx or oxidants measured as ozone; flame photometric detection analyzers for sulfur compounds and hydrocarbons; gas chromatography-flame ionization detection to separate methane from total hydrocarbons; nondispersive absorption spectrometer for SO2, NOx, carbon monoxide, hydrocarbons; dispersive absorption spectrometer for SO2, NOx, CO, hydrocarbons; ultraviolet and visible nondispersive absorption for SO2, NOx, or oxidants; high volume air samplers for collection of suspended particulates; a piezoelectric microbalance instrument for particulate mass; impactor for particulate size distribution; and opacity meters for the relative opacity of stack gas streams.

57037 **APTIC NO. 81591**

Hulls, Leonard Robin and Stephen Clow Hadden

EXHAUST RESPONSIVE ENGINE SPEED AND CONDITION INDICATOR. *(RCA Corp., New York) U. S. Pat. 3,908,167. 6p., Sept. 23, 1975. 2 refs. (Appl. June 5, 1974, 9 claims).*

The speed (RPM) of an internal combustion engine is determined by apparatus positioned to optically detect puffs of exhaust gases from the engine exhaust pipe. The puffs of exhaust gases result from ignitions in individual cylinders of the engine, and the frequency of the puffs is directly related to engine speed. An acceleration burst test giving a measure of the condition of the engine is performed without a mechanical connection to the engine by recording the time elapsed while accelerating from a low speed to a high speed. The speeds are measured by an apparatus responsive to engine exhaust gas puffs. (Author summary modified)

57038 **APTIC NO. 81272**

Husar, R. B. and W. R. Shu

THERMAL ANALYSES OF THE LOS ANGELES SMOG AEROSOL. *J. Appl. Meteorol., 14(8):1558-1565, Dec. 1975. 17 refs.*

A thermal analysis of the volatility of the Los Angeles smog aerosol was made. The smog aerosol was heated up to 250 C and simultaneously the scattering coefficient was measured using a nephelometer and the change of size distribution is measured by an optical counter. A total of 50-80% of the submicron aerosol mass was volatile at 220 C. Inspection of the shapes of thermo-nephelograms reveal that photochemically formed aerosols had distinctly different thermo-nephelograms than those obtained on humid hazy days. Thermal analyses provide a means of on-line monitoring of the origin of the ambient aerosol. (Author abstract modified)

57039 **APTIC NO. 81726**

Imagami, Kazushige

MEASUREMENT OF SOOT AND DUST CONCENTRATION IN THE EXHAUST GAS. *(Haigasuchu no baijin nado no soluteihoho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):243-247, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975.)*

An analytic method (JISZ 8808) for measuring the dust and soot concentration in exhaust gas is described. The Air Pollution Prevention Act implemented 5 years ago specifies use of this method. Problems have been encountered in attempting to improve the precision and simplicity of the method; the analytic regulations were finalized in July 1975. The 1975 revision includes the following major areas of change: a new name for the method, a new definition of dust, a simplified flow sheet, new measuring openings on the walls of a duct, the measuring point, measurement of exhaust gas temperature, measurement of water content of exhaust gas, measurement of velocity and volume of exhaust gas, the dust sampler and dust sampling method, the use of filter paper, the use of a dust tube, computations for the concentration and volume of dust, and recording of the measurements.

57040 **APTIC NO. 81471**

Ishiguro, Tatsukichi

DETERMINATION OF AIR POLLUTANT. *(Taiki osen busshitsu no sokutei ni tsuite). Text in Japanese. New Food Ind. (Japan), 17(10): 10-14, Oct. 1975.*

General problems involved in air pollutant measurement were discussed with emphasis on the importance of judgement and evaluation of individual cases. On the measurement of sulfur oxides and nitrogen oxides, various chemical analysis methods (manual and continuous) classified for the source measurement and environment measurement are reviewed with characteristics of each method and problems involved. Measurement methods for carbon monoxide, ozone, oxidant, suspended particulates, sedimented dust and other pollutants (fluorine compounds, chlorine, hydrogen chloride, acrolein, phosgene, hydrogen cyanide, ammonia, hydrogen sulfide, carbon dioxide and aldehydes) are reviewed. Measurement methods for malodorants and heavy metals in the flue gas are also reviewed with characteristics and problems involved.

57041 **APTIC NO. 81563**

Ito, T., E. Sagawa, N. Fugono, H. Yamaka, and M. Kojima

OBSERVATION EQUIPMENT OF NEUTRAL ATMOSPHERIC COMPOUNDS IN STRATOSPHERE. *(Seisoken chusei taiki sosei kansoku sochi). Text in Japanese. Tokyo Daigaku Uchu Koku Kenkyusho Hokoku (Bull. Inst. Space Aeronaut. Sci., Univ. Tokyo), 11(2):457-468, July 1975. 10 refs.*

A mass analysis apparatus for the measurement of neutral atmospheric compounds from balloons in the stratosphere (tested in the atmosphere in June 1974) is described. The measurement apparatus consists of a magnetic deflection type mass spectrometer, a vacuum pump, and various circuits. Descriptions of the mass spectrometer, the vacuum system (ion-sputter pump, getter pump), the sample injection system, the signal processing and other electrical circuits, and the space compartment and gondola are given, with block diagrams and photographs; characteristics of the measurement apparatus are discussed. The system malfunctioned at about 11 km altitude due to a high voltage discharge, and no measurement was made in the stratosphere. The water content measured using argon content as the standard was approximately constant at 2% in terms of the weight concentration ratio at altitudes between 6 km and 10 km.

57042 **APTIC NO. 77669**

Jones, Peter W., Robert D. Giammar, Paul E. Strup, and Thomas B. Stanford

EFFICIENT COLLECTION OF POLYCYCLIC ORGANIC COMPOUNDS FROM COMBUSTION EFFLUENTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-33.3.)*

A technique for the collection of polynuclear compounds from combustion effluents is described that uses a solid polymeric adsorbent. The adsorbent sampler is considerably more efficient than the commonly used impinger methods and gives quantitative collection of polynuclear compounds and trapped species. The sampling system consists of the standard Environmental Protection Agency train with the adsorbent sampler located between the filter and the impingers. Filterable particulates can be determined from the filter catch and probe wash according to Method 5, while the polynuclear compounds can be determined from the analysis of the filterable particulate and the adsorbent sampler catch. The impingers are used only to cool and dry the stack gases before they enter the dry-gas meter. The sampler employs a cylindrical column of Tenax adsorbent which is maintained at a temperature of 55 C. Laboratory and field trials indicate that the adsorbent sampler is at least twice as efficient as the EPA Method 5 train in collecting polynuclear compounds. Sample recovery time is reduced by as much as 50%.

57043 **APTIC NO. 81548**

Kipp, K. L. and D. R. Rhodes

METHOD FOR DETERMINING H2SO4 IN AUTOMOBILE EXHAUST. *Environ. Health Perspect., vol. 10:109-112, April 1975. 3 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

A relatively simple procedure for measuring sulfuric acid in auto exhaust is presented. A conventional constant volume sampler (CVS unit) was used to draw outside dilution air in through a paper filter and charcoal bed. The air then passed through two heaters in series, exiting at about 270 F. Car exhaust was then brought into the system and the dilution air and exhaust passed into a mixing chamber. Approximately 1 ft downstream from the mixing chamber a sample probe was inserted about one-third of the way into the 6 in. duct. The probe consists of a quartz tube. The portion of the probe outside of the duct is heated to approximately 300 F. This probe is connected to the heated condenser filter. The gas sample enters the condenser and passes through a coil of tubing downward through a chamber containing a medium-sintered glass frit. The sample then passes out of the condenser to the sample pump and meter for measuring sample volume. During a typical test run, the condenser is preheated to approximately 180 F and held at that temperature during collection of sample. The sample drawn for sulfate analysis represents less than 0.1% by volume of the total sample going to the CVS unit. Thus, a regular CVS procedure can be used simultaneously. The time required to obtain sufficient sample for titration is 15 to 30 min. Values on sulfates in exhaust with a catalyst car and a noncatalyst car agree well with literature data obtained by dilution tube and filtration techniques. (Author abstract modified)

57044 **APTIC NO. 81565**

Kobayashi, M.

APPLICATION OF RADIOACTIVATION ANALYSIS TO PETROCHEMICAL INDUSTRY AND ENVIRONMEN-

TAL POLLUTION. *(Sekiyu kogyo to kogai ni taisuru hoshaka bunseki no oyo). Text in Japanese. Sekiyu to Sekiyu Kagaku (Petrol. Petrochem.), 19(11):57-61, Nov. 1975.*

Activation analysis and X-ray fluorescence analysis are particularly suitable for the determination of ultramicro-amounts of pollutants, because of their sensitivity. The measurement principle of activation analysis and RI X-ray fluorescence analysis is described with respresentative nuclear reactions utilized in activation analysis. Examples of the application of the activation analysis method in the petrochemical industry are given, with analytical results for measuring heavy oil and vanadium in crude oil using gamma rays. The gamma ray analysis of suspended particulates, the activation analysis of water pollutants and the suspended particulate determination by RI X-ray fluorescence analysis are discussed.

57045 **APTIC NO. 81692**

Koda, Y.

NOX ANALYTICAL MEASURING DEVICE BY THE CHEMILUMINESCENCE METHOD. *(Kagaku hakkoho ni yoru NOx bunseki keisokuki (2)). Text in Japanese. Otomeshon (Automation), 20(9):23-28, Sept. 1975. 3 refs.*

A new Shimazu model NOA-302A chemiluminescence nitrogen oxides meter was developed. The new model was an improved type of model NOA-302. The Model NOA-302A consists of a sampling system and an analytical system. The sampling system includes a sampling probe made of corrosion-resisting materials such as quartz, teflon, or ceramics, a primary multilayered glass wool filter which removes particles larger than 5 micron in size, a nitrogen dioxide converter which uses carbon as a reducing agent, a bubbling separator, and a secondary filter which removes particles abovve 0.5 micron in size. The analytical system consists of a reactor in which the sample gas reacts with ozone, an ozone generator, a flow regulator, a detector, and an ozone removing device. The primary and secondary filters require replacement in 6-mo and in 1 mo, respectively.

57046 **APTIC NO. 81365**

Landis, D. A.

COMMENTS ON THE CALIBRATION OF A FH62A DUST MONITOR. *Atmos. Environ., 9(12):1079-1081, 1975. 2 refs.*

Mass calibration experiments were performed with a dust monitor. The mass of various particulates collected by the monitor and a glass fiber filter were compared. The sensitivity decreased as the aerosol size and density of material decreased. The atmospheric calibration also changed depending upon location, presumably due to changes in aerosol composition and relative humidity. To check for sources of error, results obtained with a lead nitrate aerosol by weighing and atomic absorption spectrometry were compared. They show that losses in the sampling system were not a large source of error. To check the filter collection efficiency, two glass fiber filters were compared with the apparatus and flow rates used previously to compare the mass monitor with a glass fiber filter. Polystyrene latex and sodium chloride aerosols were used, and results showed the same equivalent mass collected by the two filters. The response of the mass monitor to air at various relative humidities was investigated. Clean, particle-free air was bubbled through water to produce a saturated mixture of air and water vapor, whose temperature was changed to control the relative humidity. A check on the accuracy of the relative humidity measurement was performed by capturing all of the water vapor with a molecular sieve trap and weighing the sieve to determine the weight of water vapor in the air. Maximum error was + or - 4%. The effect previously attributed to the absorption of water vapor by the NaCl aerosol appears to be merely the response of the mass monitor to water vapor. Possible reasons for the variation of the calibration of the mass monitor with aerosol size, chemical composition, and relative humidty are discussed.

57047 **APTIC NO. 81218**

Lilienfeld, Pedro

DESIGN AND OPERATION OF DUST MEASURING INSTRUMENTATION BASED ON THE BETA-RADIATION METHOD. *Staub, Reinhaltung Luft, 35(12): 458-465, Dec. 1975. 30 refs.*

The theory, instrumentation, and use of beta-radiation attenuation for the measurement of mass concentrations of airborne particulates are reviewed. Applicable methods of particle collection, beta sensing configurations, source and detector design criteria, and electronic signal processing are treated. Advantages, limitations, and sources of error of beta-attentuation instrumentation are analyzed. Applications to industrial dust measurements, source testing, ambient monitoring, and particle size analysis are the major practical uses. It s inherent capability for automated and unattended operation provides compatibility with process control surveillance and alarm systems, telemetry, and incorporation into pollution monitoring network sensing stations.

57048 **APTIC NO. 81294**

Lueb, R. A., D. H. Ehhalt, and L. E. Heidt

BALLOON-BORNE LOW TEMPERATURE AIR SAMPLER. *Rev. Sci. Instr., 46(6):702-705, June 1975. 5 refs.*

The design, construction, and performance of a balloon borne low temperature air sampler are described. The sampler can collect 16 samples of 10 liter STP at different stratospheric altitudes. The collected samples allow measurement of the trace gases hydrogen, water, methane, carbon monoxide, carbon dioxide, and nitrous oxide. Future measurements include the freons, carbon tetrachloride, sulfur hexafluoride, CH3OH and nitrogen oxides. (Author abstract modified)

57049 **APTIC NO. 78308**

Luft, K. F.

INFRARED TECHNIQUES FOR THE MEASUREMENT OF CARBON MONOXIDE. *Ann. Occupational Hyg., 18(1):45-51, 1975. 5 refs.*

Selective response to infrared radiation is obtained without spectral dispersion. Radiation from a heat source, such as an incandescent wire, passes through a sample cell containing the gas mixture to be analyzed and into a detector filled with carbon monoxide, the gas whose concentration is to be determined. The radiation passes both cells unweakened except for the parts which fall into the absorption ranges of the gases in the sample. These are weakened in the sample cell in proportion to the amount of the gases present. The remaining radiation which falls into the CO absorption range is almost completely absorbed by the CO in the detector cell, heating the detector gas. The other radiation ranges do not contribute to this rise in temperature. Thus, the amount of heating is a measure of the radiation in the CO absorption range remaining after the preliminary absorption in the sample cell, and depends on the CO concentration in the sample cell. The rise in pressure caused by the heating of the gas can be measured with a condenser microphone. A double beam system is normally employed, in which parallel light beams pass through the sample cell and a reference cell. The detector responds to the differential selective absorption of the radiation in the two beams. This system gives zero stability and enables very small temperature and pressure changes to be detected. A two-layer detector cell has been introduced which further improves the stability and selectivity. (Author abstract modified)

57050 **APTIC NO. 81070**

Lundgren, Dale A. and Thomas C. Gunderson

EFFICIENCY AND LOADING CHARACTERISTICS OF EPA S HIGH-TEMPERATURE QUARTZ FIBER FILTER MEDIA. *Am. Ind. Hyg. Assoc. J., 36(12): 866-872, Dec. 1975. 14 refs.*

The efficiencies of microquartz and Gelman type A filters were evaluated over a range of temperatures, particle sizes, volatilities, and gas velocities. Submicron particles penetrated more than larger particles, and most at the highest filtration velocity tested (51 cm/s). Aerosol penetration was never more than 0.10%. Nonvolatile particles penetrated less with increasing temperature and increasing filter loading. Particles with vaporization points below the sampling temperature, including sulfuric acid, could vaporize, pass through the glass fiber filters, and then recondense when cooled below their dewpoints. Hot stack gases, sampled at different filter temperatures, were not necessarily comparable. Particulate emission standards must involve a suitable reference temperature to allow proper enforcement.

57051 **APTIC NO. 77646**

Mendelsohn, Eric S., Sue Ellen Bounds, Jimmie J. Nelson, Bryan Cloyed, and Barry Kumar

COOPERATIVE CALIBRATION PROGRAM FOR THE PHOTOCHEMICAL OXIDANT MONITORS IN THE NATIONAL CAPITOL INTERSTATE AIR QUALITY CONTROL REGION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 15p., 1975. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-10.3.)*

Jurisdictions of the National Capital Interstate Air Quality Control Region participated in a cooperative effect from April through June 1974 to calibrate photochemical oxidant monitors as part of a quality assurance program. The calibration program included 14 such monitors scattered throughout the Washington Metropolitan area. Secondary reference sources consisted of three variable concentration ozone generators. All of the photochemical oxidant monitors utilized the Environmental Protection Agency chemiluminescence reference method for the monitoring of ozone in ambient air. Environmental Protection Agency quality assurance procedures were used as guidelines for the primary and secondary calibrations. The successful calibration of the monitors required adequate primary calibration of the generators. Factors such as potassium iodide standardization, sulfur interference, temperature stability, and adequate sample flow measurement tended to significantly affect the calibration results. The EPA quality assurance procedures appeared to be adequate for the regional calibration of photochemical oxidant monitors. (Author abstract modified)

57052 **APTIC NO. 81667**

Micheli, Adolph L. and Glenn E. Sutherland

THERMOELECTRIC EXHAUST GAS SENSOR. *(General Motors Corp., Detroit, Mich.) U. S. Pat. 3,906,721. 6p., Sept. 23, 1975. 5 refs. (Appl. Aug. 22, 1974, 3 claims).*

An extremely durable and high output thermoelectric sensor for detecting the quantitative content of combustibles in the exhaust gases of an internal combustion engine is described. A U-shaped ceramic body of doped titanium dioxide is mounted in an exhaust system with ends of leg portions on the body outside of the exhaust gas flow. Chromel wires are embedded into these ends to form two thermocouple junctions with the ceramic body. Platinum coated alumina particles fill an opening in an area of the ceramic body exposed to the exhaust gas flow near one junction. Heat generated by incompletely burned exhaust gas oxidizing on the platinum makes the nearby junction hotter than the other junction. The difference in output between the two junctions is proportional to the concentration of combustibles in the exhaust gases. Others sensors lack the durability and accuracy of this sensor. (Author abstract modified)

57053 **APTIC NO. 81109**

Mioduszewski, Peter

STATE OF DEVELOPMENT AND POSSIBILITIES OF APPLICATION OF LASERS. *(Entwicklungsstand und Einsatzmoeglichkeiten von Lasern). Text in German. Chem.-Ing.-Tech., 47(16):670-677, 1975. 77 refs.*

The state of development and possible uses of lasers are reviewed. The reflection and scattering of laser rays is utilized in LIDAR techniques for the measurement of meteorological parameters in the troposphere and stratosphere and in environmental protection. It is possible to measure nitric oxide concentrations in automobile exhaust gases at minimum concentrations below 1 ppm by Raman scattering measurement. Laser holography can be used for the measurement of the size and distribution of aerosol particles.

57054 **APTIC NO. 81686**

Mochizuki, Sadamu, Sumio Masuda, and Toshio Sekigawa

A PLAN FOR SUBMICRON AEROSOL PARTICLE IDENTIFICATION BY COMBINATION OF MOBILITY MEASURING APPARATUS AND ELECTRON MICROSCOPE. *(Idodo sokuteiki to denshi kenbikyo ni yoru sabu mikuron erozoru ryushi dotei no ichi shian). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 144, 1975. (Presented at the Japan Meteorological Society, Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Oct. 29-31, 1975, Paper 302.)*

Submicron aerosol particles were identified by using a combination of X-ray energy spectrometer connected to an electron microscope, and a parallel-plate type mobility spectrometer. Aerosol samples were collected at Hachijo Island in March 1975. Spectrograms and diagrams of the apparatus are included.

57055 **APTIC NO. 81361**

Mooibroek, Joseph

SMOKE DETECTOR. *U. S. Pat. 3,914,616. 4p., Oct. 21, 1975. 2 refs. (Appl. Aug. 5, 1974, 10 claims).*

An optical smoke detector design using three concentric walls with staggered openings to insure an absolutely dark interior chamber is described. The openings can be made quite large, allowing easy entry of smoke into the chamber. Accordingly, it is possible to design a device which will respond quickly and still have a high sensitivity. The invention also includes a special housing surrounding the detection chamber which includes a large number of narrow flow disrupting slots. This housing not only protects the chamber itself but the slots break up the air flow around the device, causing eddy currents which bring in the smoke and encourage its flow into the detection chamber. (Author abstract modified)

57056 **APTIC NO. 81697**

Morishita, H.

NOX ANALYTICAL MEASURING DEVICES BY CONSTANT-VOLTAGE ELECTROLYSIS. *(Teideni denkaiho ni yoru NOx bunseki keisokukiki). Text in Japanese. Otomeshon (Automation), 20(9):51-55, Sept. 1975.*

A general discussion is given on nitrogen oxides measuring devices based on constant-voltage electrolysis. The devices generally consist of a gas sampling tube, a cooling jacket or an electric dehumidifier for removing moisture in the waste gas, a pretreatment apparatus which has a primary filter to remove small particulates and mists before the sample is supplied for analysis, and an analyzer. The analyzer is usable for simultaneous NOx, sulfur dioxide, and oxygen analysis. The measuring ranges can be selected from 0-100 ppm to 50-10,000 ppm. Substances which interfere with NOx determination are treated with specific reagents. Sulfur dioxide is removed by 3% hydrogen peroxide or alkaline solution of sodium bicarbonate, potassium nitrate, potassium carbonate, or potassium nitrite. Ammonia lower than 200 ppm does not interfere with the determination but the removal is desirable due to their reaction with the electrolytes.

MEASUREMENT METHODS

57057 **APTIC NO. 78102**

Nader, John S.

CURRENT TECHNOLOGY FOR CONTINUOUS MONITORING OF PARTICULATE EMISSIONS. Air Pollution Control Assoc., 25(8):814-821, Aug. 1975. 40 refs.

Particulate matter is characterized by its physical and chemical properties. Federal and state emission standards identify two important physical properties, opacity (visible emissions) and particulate mass concentration. In addition, particle size and particle composition are characteristics that play a significant role in the assessment of health effects, visibility, and control strategy. Systems to monitor these particle characteristics are in various stages of development. Opacity monitors have the longest history of commercial availability and of applicability to various source emissions. Particulate mass monitors have a short history as commercially available systems and are under evaluation in various source applications. Particle monitors are mainly in the advanced prototype development stage. Real time size monitoring systems will eventually be wedded to real time particle composition analyzers to give a monitoring system for particle size distributions of chemical constituents.

57058 **APTIC NO. 81161**

Nagai, K., K. Naka, K. Matsubayashi, H. Hirobe, M. Takatsuka, and M. Murata

STUDIES ON ATMOSPHERIC HYDROCARBON ANALYSIS (PART I). *(Taikichu tanka suiso no bunseki ni kansuru kenkyu (Dai ichi-ho). Text in Japanese. Karkyo Gijitsu (Environ. Conserv. Eng.), 4(10):735-743, 1975. 20 refs.*

Atmospheric hydrocarbons and non-oxide pollutants were separated and quantitatively determined by gas chromatography. A 4-column gas chromatography installation was used, consisting of precut, dummy, main, and choke columns, packed with Diasolid M. The precut and dummy columns (40 C) contained non-polar squalane. The main column (1-2 C) contained squalane and strongly polar beta, beta prime-oxydipropionitrile (ODPN) and sebaconitrile. The choke column (40 C) contained sebaconitrile and ODPN. Gas samples were heated to 100 C, before introduction into the columns. Components were separated by boiling points, by precutting at 5-minute, 10-second intervals, and gaseous hydrocarbons were introduced into the main column. Other components were eliminated through the choke column. With standard samples, ethane, ethylene, propylene, 1-butane, isobutane, and 1,3-butadiene were separated in the main column. High-boiling hydrocarbons were passed through a column (100 C, containing dioctyl sebasate (DOS)), without precutting. For standard gas mixtures, good separation resulted for n-octane, benzene, toluene, xylene, styrene, and ethyl benzene. Incomplete separation of acrolein, ethyl formate, methyl acetate, MEK, and methyl acrylate resulted when the intermediate-boiling hydrocarbons were passed through the precut (ODPN), main (squalane, sebaconitrile), and choke (dinonyl phthalate (DNP)) columns.

57059 **APTIC NO. 81212**

Neefus, John D.

COTTON DUST SAMPLING: I. SHORT TERMED SAMPLING. *Am. Ind. Hyg. Assoc. J., 36(6):470-476, June 1975. 6 refs.*

A short terms sampler for the cotton dust fraction with aerodynamic diameters between 17 micron and 0.2 micron is introduced. Current standards and criteria are discussed. When the new sampler is used in conjunction with a corretly designed vertical elutriator, it gives equivalent results to the Lumsden Lynch vertical elutriator. The short term sampler not only offers results which can be applied to the ACGIH TLV but offers an effective means of environmental surveillance in a byssinosis prevention program with the additional advantages of immediate readout short termed sampling and truer employee exposure. (Author abstract modified)

57060 **APTIC NO. 81696**

Ochiai, S. and S. Arami

NOX ANALYTICAL MEASURING DEVICE BY NON-DISPERSIVE INFRARED ABSORPTION METHOD. *(Hi bunsan sekigaisen kyusho ho ni yoru NOx bunseki keisokuki (I)). Text in Japanese. Otomeshon (Automation), 20(9):34-38, and 28, Sept. 1975. 5 refs.*

A Yokokawa model 8240 non-dispersive infrared type nitrogen oxides measuring apparatus is described. The apparatus uses a filter probe for sampling stack gas at 100-400 C. Dusts in the waste gas are removed by a primary filter consisting of five layers of metal nets (75 micron), a secondary filter (15 micron), and a third filter (0.2 micron). A REAPACK converter packed with REAPACK-DS converts nitrogen dioxide to nitric oxide at 400 C. Sulfur dioxide and sulfur trioxide mists in the resulting gas are removed by passing through a water bubbler. Replacement of the REAPACK-DS should be carried out once very three months to insure constant performance. Sampling at temperatures below 100 C or above 400 C requires an additional drain separator. The apparatus is applicable to a concentration range of 0-100 ppm. The REAPACK converter gave the higher conversion rates than those of other manufacturers.

57061 **APTIC NO. 81075**

Odell, A. P. and J. A. Weinman

THE EFFECT OF ATMOSPHERIC HAZE ON IMAGES OF THE EARTH S SURFACE. *J. Geophys. Res., 80(36):5035-5040, Dec. 20, 1975. 11 refs.*

The adding method to solve the equation of radiative transfer was applied to a sunlit haze above a reflecting surface. The method was modified to include the effect of inhomogeneities on the underlying surface whose dimensions are less than the mean free path of the photons in the haze. Numerical examples of surface feature contrast degradation due to haze are presented. This analysis renders it feasible to determine the optical thickness of hazes from haze degraded images of the ground. A technique was developed to restore ground image contrast which was obscured by haze, for images of the earth s surface obtained with spectrophotometric instrumentation carried on board aircraft and earth-orbiting satellites.

57062 **APTIC NO. 81396**

Ogikubo, Takeo and Suio Abe

DETERMINATION OF SUSPENDED PARTICULATE MATTER IN THE ATMOSPHERIC ENVIRONMENT. *(Kankyochu fuyu ryushijo busshitsu no sokutei). Text in Japanese. PPM (Japan), 6(11):50-59, 1975.*

The determination of suspended particulates in the atmosphere is discussed. The principles and design of a multistage low-volume air sampler and a digital dust indicator, and the evaluation of the relative sensitivity of the digital dust indicator were studied. The continuous measuring of aerosols was tested using a digital dust indicator (D) and a multistage low volume air sampler (LOW-S) in the Ueno area of Tokyo during a period of one year commencing in January 1974. The object of the experiment was to find the effects of meteorological factors (F) on the relation F equals LOW-S divided by D and dispersion, the relation of F and relative humidity, the monthly change in F, and the comparison of air samplers with a separator (LOW-S) and without a separator (LOW-O). The sensitivity correction for the 400 digital dust indicators throughout Japan, conducted by Shibata Chemicals, is reported, which has improved the sensitivity of the indicators by a factor of 6. This correction complies with the Aerosol Environmental Standard and Analytic Method issued by the Environmental Agency in 1973.

57063 **APTIC NO. 81628**

Okabe, Hideo and Frederick P. Schwarz

NITRIC OXIDE POLLUTION MONITOR. *(Dept. of Commerce, Washington, D. C.) U. S. Pat. 3,906,226. 6p., Sept. 16, 1975. 5 refs. (Appl. March 29, 1974, 1 claim).*

A fluorescence method for determining relatively small concentrations of nitric oxide in a gaseous mixture is described. The method is applicable to the quantitative determination of NO in gas streams containing water, carbon monoxide, carbon dioxide, oxygen, ethylene, propane, hydrogen, and sulfur dioxide. Irradiation of NO by ultraviolet light in the region from 2100 to 2300 A produces excited NO, the fluorescence of which is measured in the 2200 to 3200 A region and is proportional to the NO concentration in a gas stream, whether the gas stream is NO in nitrogen, air, stack, gas, or automobile exhaust gas. Prior techniques for monitoring NO are more complex and expensive because they are as based on a chemiluminescent reaction, in which ozone is generated and reacted with NO to produce fluorescing nitrogen dioxide molecules.

57064 **APTIC NO. 81714**

Okita, Toshiichi and Ikuei Kifune

DETERMINATION OF FATTY ACIDS, METHYLAMINES, AND AMMONIA IN THE ATMOSPHERE BY IMPREGNATED FILTER PAPERS. *(Roshiho ni yoru shibosan, mechiruamin, anmonia no sokuteiho no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(3):87-91, 1975. 4 refs.*

Butyric and valeric acid vapors were collected on sodium hydroxide- impregnated filter paper, and analyzed quantitatively by gas chromatography. Methylamines and ammonia were collected on cellulose filter paper, impregnated with oxalic acid, and analyzed. The fatty acids (n-butyric, isobutyric, n-valeric, isovaleric; 16-2000 micrograms) were extracted from the filters into n-hexane or benzene acidified with HCl, and the extract solution was injected into a gas chromatograph. With 5 min of air sampling, 2 ppb n-butyric acid and 0.9 ppb isovaleric acid could be determined. Recovery and collection efficiencies of fatty acids from NaOH-impregnated filters were nearly 100%. The packing material for the gas chromatography column, which best reproduced the four fatty acid peaks was PEG, followed by TMCBA, then FFAP. Methlamines (mono-, di-, tri-) were extracted from the filters with 40% NaOH, and the regenerated gases were trapped in cooled ethanol. The collection and elution efficiencies for monoethylamine were 93%; for dimethylamine and trimethylamine, almost 100%. Gas flow rates for methylamines at the time of collection on filters, ranged from 1-14.5 l/min. Ammonia gas was collected on oxalic acid-impregnated filter paper, at a flow rate of 10 l/min. A collection efficiency of almost 100% was obtained. The blank value of ammonia on filter paper (25 by 20 cm) was about 3.4 micrograms.

57065 **APTIC NO. 81184**

Ravey, M. and J. Klopstock

TRACE ANALYSIS OF VINYL CHLORIDE IN PVC AND IN THE ATMOSPHERE. *J. Chromatographic Sci., 13(11):552-553, Nov. 1975. 6 refs.*

A gas chromatographic method capable of determining 1.5 microgram vinyl chloride (VC)/g polyvinyl chloride in polymer and 50 ppb vinyl chloride in air is described. Solutions of 1 and 10 microgram VC/ml 1,2 dichloroethane (EDC) still retained above 95% of their vinyl chloride concentration after 2 days. Polyvinyl chloride at a concentration of 2% did not interfere with the analysis. The temperatures of the injection block and the hydrogen flame detector were 120 and 200 C, respectively. A 5.5 m, one-eighth inch packed aluminum tube was used. Production of 100 ppm, 10 ppm, and 1 ppm standard gases is discussed. Solution standards were prepared with EDC as the solvent. Baseline recovery for gas standards required only a few min but for actual air samples this will depend on the degree of pollution of the air by other materials.

57066 **APTIC NO. 81467**

Riseman, John H., Martin S. Frant, and John A. Krueger

HYDROGEN SULFIDE SENSING CELL. *(Orion Research Inc., Cambridge, Mass.) U. S. Pat. 3,915,831. 6p., Oct. 28, 1975. 4 refs. (Appl. April 9, 1973, 6 claims).*

An improved gas-sensing electrochemical cell for measuring dissolved hydrogen sulfide in a sample solution is claimed. The cell consists of a potentiometric sulfide ion-sensitive electrode and a fluoride ion-sensitive electrode, both in contact with an acid internal standard solution comprising an aqueous solution of a fluoride salt. A hydrophobic hydrogen sulfide gas-permeable membrane separates the sample solution from the internal solution. (Author abstract)

57067 **APTIC NO. 81352**

Sarteur, R. and J. C. Fayard

ANALYSIS OF SULPHUR PRODUCTS PRESENT IN THE AMBIANCE OR ENVIRONMENT OF A REFINERY -- QUANTITATIVE DETECTION AT P.P.B. LEVEL.. *(Analyse des produits soufres presents dans l ambiance ou l environnement d une raffinerie). Text in French. Pollut. Atmos. (Paris), 17(65):14-17, Jan.-March 1975. 7 refs.*

A trapping system for the quantitative analysis of sulfur compounds present in the ambient air of a refinery is described. The system was applied to the analysis of light S products: methyl mercaptan, dimethyl sulfide, and dimethyl disulfide. The detection limits attained were microgram/cu m for hydrogen sulfide, and 0.1 microgram/cu m for heavier S compounds. The analysis remained quantitative for a trap preservation time not exceeding 3-4 hr. Within these limits the accuracy was 10-15%.

57068 **APTIC NO. 78204**

Sawabata, Takashi and Ichiro Inoue

A SIMPLE MEASURING DEVICE FOR SMOKE AND SOOT CONCENTRATION. *(Baien nodo kani sokuteiki). Text in Japanese. (Rikagaku Kenkyusho, Wako-city (Japan)) Japan. Pat. Sho 50-21872. 2p., July 1975. (Appl. July 15, 1965, 1 claim).*

A simple measurement device for the concentration of soot and its flow distribution within chimney is described. The detector is a rod with several spacers on it. An impaction ring, made of glass or synthetic resin, is located between two spacers, and the diameter of the impaction ring is smaller than that of the spacers. Oils are smeared on the impaction ring, to which smoke and soot adhere. The amount of smoke and soot can be determined by exposing the impaction ring in chimney and by measuring the thickness of the soot accumulated on the smeared oil film. The soot concentration in the smoke can be calculated by knowing the adhesion efficiency of the soot on the impaction ring. If several impaction rings are placed on the same rod at different locations, the soot distribution within the chimney can also be determined.

57069 **APTIC NO. 78292**

Schmidt, Klaus H.

A CONDENSATION NUCLEUS SIZE ANALYZER SUITABLE FOR STUDYING THE KINETICS OF AEROSOL FORMATION. *(Intern. J. Chem. Kinet.), vol. 1975:557-565, 1975. 2 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st Warrenton, Va., Sept. 15-18, 1974.)*

An instrument for determining the number and size distribution of condensation nuclei ranging from 1 to 20 nm in radius is described. The operation of the device is based on the cloud chamber principle. The humidified gas mixture to be analyzed undergoes an adiabatic expansion for about 2 sec. The fog droplet formation during this time is followed by repetitively scanning a small volume illuminated by a pulsed ion laser with a highly sensitive television camera connected to electronic counting circuitry. The distribution of the number concentration versus the critical radius is computer- calculated from the number of appearing fog droplets and the pressure drop as a function of time. (Author abstract modified)

57070 **APTIC NO. 81609**

Schulten, H. R. and U. Schurath

AEROSOLS ANALYSIS BY FIELD DESORPTION MASS SPECTROMETRY COMBINED WITH NEW SAMPLING TECHNIQUE. *Atmos. Environ., 9(12):1107-1112, 1975. 19 refs.*

The use of field desorption mass spectrometry for the analysis of inorganic and organic aerosols is described. Aerosols are collected by direct impaction on a field emitter which is subsequently transferred into a mass spectrometer. Sub-microgram sample quantities are sufficient for an analysis due to the method s high sensitivity. The analysis of a predominantly inorganic natural aerosol revealed 41 lines in the spectrum, 36 of which were assigned to ions of inorganic salts and to cluster ions of these salts. Sodium, potassium, ammonium, and rubidium were present as cations; while nitrate, sulfate, bisulfate, and chloride were present as anions. A predominance of nitrate ion was significant in terms of the importance of aerosols as a sink for nitrogen dioxide in the atmosphere. The mass spectral analysis of an acetone suspended aerosol revealed a mixture of aliphatic hydrocarbons of high molecular weight and corresponding low volatility. No ions were detected in the range of 107-365 atomic mass units.

57071 **APTIC NO. 76762**

Schutz, Alfred

EVALUATION OF HEALTH HAZARDS BY MINERAL DUSTS IN WORKING AREAS - LIMIT VALUES FOR QUARTZ AND ASBESTOS, MEASUREMENT METHODS. *(Beurteilung der Gesundheitsgefahren durch mineralische Staeube am Arbeitsplatz - Grenzwerte fuer Quartz und Asbest, Messmethoden). Text in German. Staub, Reinhaltung Luft, 35(7):263-266, 1975. 15 refs.*

The assessment of dust levels in a working area where silicogenous materials were used was performed according to a method specified by the regulation for the prevention of accidents. The method is based on the maximum allowable concentrations for quartz and asbestos in working areas and measurement methods for the determination of respirable dust and the amount of noxious substances in it. The fine dust was separated by a new flow conduction method. The concentration of fine dust was then determined by measurement of the absorption of beta-rays. X-ray diffraction was used for determination of quartz, and infrared spectrography for chrysotile asbestos.

57072 **APTIC NO. 75374**

Sibbett, D. J., R. H. Moyer, and T. R. Quinn

IMPROVEMENT OF INSTRUMENTATION AND METHODOLOGY FOR COLLECTION AND ANALYSIS OF MERCURY (FINAL REPORT). *Geomet, Inc., Pomona, Calif., Environmental Protection Agency Contract 68-02-1282, Program Element 1AA010, ROAP 26-AEK-38, Rept. EPA-650/2-75-028, LF-434, 85p., Jan. 1975.*

NTIS: PB 242295/AS

Improvements in instrumentation and methods for the sampling and analysis of airborne mercury are described. A miniaturized collection device is illustrated that consists of a two-section canister assembly which fits inside a standard high-volume sampler underneath the support screen for the particulate filter. Particulate mercury is collected in the usual manner on glass fiber filters, and mercury vapors are trapped on specific absorbents (elemental mercury on silver-impregnated alumina in the upper canister section and combined mercury vapors on charcoal in the lower section). An overflow of 8-9.5 l/min is obtained through the canister with the high-volume sampler operating at 24 cu ft/min. Recoveries average 101% for particulate mercury, 104% for elemental mercury, and 96.3% for organic mercury compounds. Gaseous pollutants such as sulfur dioxide, nitrogen dioxide, or hydrogen sulfide do not affect the collection efficiency. An atomic absorption spectrophotometric method for the analysis of the mercury compounds is described that uses an induction combustion furnace. The standard deviation of results obtained with the method is in the 6-8% range. (Author abstract modified)

57073 **APTIC NO. 81359**

Singh, Hanwant Bir, Daniel Lillian, and Alan Appleby

ABSOLUTE DETERMINATION OF PHOSGENE: PULSED FLOW COULOMETRY. *Anal. Chem., 47(6):860-864, May 1975. 18 refs.*

Pulsed flow coulometry (PFC) was developed for the absolute analysis of reactive electron absorbing air pollutants, which undergo decomposition in a gas chromatographic column. It is used successfully for the determination of sub-ppb mixtures of phosgene in air. Compared to permeation tube standards, an error of less than 15% is easily achieved when ionization efficiencies are greater than 75%. At ionization efficiencies greater than 85%, this error is reduced to 4%. The electron capture detector response to phosgene is comparable to that to carbon tetrachloride. Mixtures of ppb phosgene in air are stable in the presence of moisture and undergo rapid deterogeneous decay on surfaces. Pulsed flow coulometry is used for the analysis of any unstable electron adsorber (peroxyacetyl nitrate, chlorine dioxide, trichloroacetyl chloride) in air and offers a wide scope of application in air pollution and industrial hygiene. (Author abstract modified)

57074 **APTIC NO. 81575**

Suzuki, Shigetaka, Kunio Nagashima, and Hiroshi Mihira

A DETECTION ELEMENT FOR CONTINUOUS MEASUREMENT OF OZONE USING SOLID ELECTROLYTE. *(Kotai denkaishitsu o mochiiru ozon no renzoku sokuteiyo kenshutsu soshi). Text in Japanese. Preprint, Chemical Society of Japan, Tokyo, p. 316, 1975. (Presented at the Japan Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975.)*

A detector element using solid electrolyte was developed for the continuous measurement of ozone. The detector element consists of a silver iodide pellet (diameter 13 mm, thickness 1 mm) as solid electrolyte, a silver pellet (same size as AgI) and platinum gauze as the active electrode arranged in the order of Pt-AgI-Ag. The detector element was arranged as a galvanic cell, and its response was tested using a sample gas containing 2.3 ppm of O3 and varying the cell temperature. The response to O3 increased rapidly at temperatures above 90 C. The calibration curve was obtained at 120 C by varying O3 concentrations. The response was linear up to 2 ppm of O3 concentration. The reduced response at concentrations above 2 ppm is attributable to the reduction in reaction efficiency due to the reactivity of cell surface and cell structure.

57075 **APTIC NO. 81727**

Suzuki, Yukio, Kosaku Ozaki, Sakingo Imai, and Akira Hamaguchi

DETERMINATION OF ACROLEINS AND ITS RELATED COMPOUNDS IN ATMOSPHERE. *(Taikichu akurorein kanren kagobutso no solutei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):391, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 61.)*

The quantitive analysis of airborne compounds related to acroleins was conducted by a joint effort of the Kobe Municipal Environmental Pollution Control Section and the Environmental Protection Research Section. R. A. Alzrcon s analytic method was used for selective analysis of the compounds, in which the reaction product of m-aminophenol and acrolein was detected by fluorescence analysis. The following conditions for the analysis was found suitable: concentrations of m-aminophenol of 0.015 m mol/ml, addition of hydrochloric hydroxylamine at approximately 0.029 m mol/ml, a temperature of 100 C, a reaction duration of 10 min, and acidic and neutral pH conditions. The fluorescence analysis indicated that acroleins and other aldehyes peaked in the neighborhood of 350 m micron in an acidic pH condition, and acrolein and compounds related to acrolein such as crotonaldehyde peaked in the neighborhood of 335 m micron in a neutral pH condition.

57076 **APTIC NO. 81141**

Tanabe, Kazutoshi

INFRARED INTENSITY MEASUREMENT OF GAS PHASE MOLECULES. *J. Mol. Struct., 29(2):319-327, Dec. 1975. 35 refs.*

A new extrapolation method is proposed for the measurement of infrared absorption intensities of gas phase molecules. A linear relationship of the logarithm of the observed intensity against the observed peak absorbance is utilized. An application of this method to carbon monoxide and methane subscript nu4 bands to satisfactory results. (Author abstract)

57077 **APTIC NO. 81578**

Tanaka, Masao

CONTINUOUS DETERMINATION OF CARBON MONOXIDE. *(Issanka tanso no renzoku sokutei). Text in Japanese. PPM (Japan), 6(11):42-49, 1975. 6 refs.*

Continuous measurement methods for carbon monoxide and recent trends in the measurement system for CO in atmosphere and at emission source are reviewed. The CO measurements by infrared gas analysis method, gas chromatography, electrochemical method (electrolysis), combustion heat measurement method, mercuric oxide method and iodine pentoxide method are described with measurement principle, measurementt procedure, characteristics and flow sheet of measurement system. Measurement methods for CO in the atmosphere (non-dispersive infrared gas analyzer), CO in flue gas (infrared gas analyzer), and CO in automotive exhaust gas (CO meter) are also reviewed with descriptions of sampling method and analysis system.

57078 **APTIC NO. 81130**

Thomerson, D. R. and K. C. Thompson

SAMPLE ATOMIZATION IN ATOMIC ABSORPTION SPECTROSCOPY. *Chem. Brit., 11(9):316-320, Sept. 1975. 24 refs.*

The application of vapor and non-flame (electrothermal) methods of sample atomization in atomic absorption spectroscopy is discussed. Vapor techniques are limited to a small number of elements but are basically simple low cost devices. Two systems are in routine use, one for mercury and the other for the metals antimony, arsenic, bismuth, germanium, selenium, tellurium, and tin, which form volatile covalent hydrides on reduction. With flameless (electrothermal) atomization the nebulizer spray chamber and flame are replaced by a resistivity heated device (usually of graphite). Flame atomizers are successful in clinical, metallurgical, petroleum products, foodstuffs, industrial, and water and effluents applications.

57079 **APTIC NO. 81693**

Tsujikawa, T.

NOX ANALYTICAL MEASURING DEVICE BY NON-DISPERSIVE INFRARED ABSORPTION METHOD. *(Hi bunsan sekigaisen kyshu ho ni yoru NOx bunseki keisokuki (2)). Text in Japanese. Otomeshon (Automation), 20(9):39-45, Sept. 1975.*

A general discussion is given on nitrogen oxides analysis by non-dispersive infrared analysis. An AS type detector utilizes an optical filtration method to eliminate interferences from carbon dioxide and moisture, and NOx at very low concentration can be determined without difficulty. The current lowest measuring range is 0-100 ppm but a detector with a lower range of 0-50 ppm is being developed. Sulfuric acid mists in waste gas could cause serious drift in the detector. They are removed by using absorbent or by scrubbing. Converters for nitrogen dioxide are usually operated at 200 C or 400 C. The rate of conversion is more than 97% for either type. A low-temperature converter is desirable in order to reduce sulfur trioxide formation, which is the main cause of sulfuric acid mists. The development of new technology for improving the NO2 converter and reducing the loss of nitric oxide and NO2 are essential in order to determine NOx concentration at low levels.

57080 **APTIC NO. 81472**

Uehara, Hiromichi, Satoshi Arimitsu, and Yasuharu Ijuin

METHOD OF OXIDIZING AND/OR RECOLLECTING WATER-SOLUBLE AND/OR WATER-DECOMPOSABLE SUBSTANCES INCLUDED IN THE AIR AND APPARATUS FOR PERFORMING THE SAME. *(Sagami Chemical Research Center, Tokyo (Japan)) U. S. Pat. 3,904,739. 6p., Sept. 9, 1975. 10 refs. (Appl. Sept. 10, 1973, 5 claims).*

A method of oxidizing and/or recollecting water soluble and/or water decomposable air pollutants is described. The pollutants in polluted gas, such as stack gas, exhaust gas of automobiles, and polluted urban air include peroxides, isocynates, sulfur dioxide, and nitrogen oxides. These substances are cold trapped by the cooling polluted air in contact with phosphorus pentoxide to a temperature at or below that at which the substances are solidified. The phosphorus pentoxide is heated to the normal temperature and the trapped substance is recollected. When the polluted air includes nitric oxide, it is oxidized and collected as gaseous nitrogen dioxide. There is no other technique to cold trap water decomposable substances existing in polluted air. (Author abstract modified)

57081 **APTIC NO. 81360**

Wagner, John P., M. May, and A. Fookson

COMPARATIVE PERFORMANCE OF IONIZATION VS PHOTOELECTRIC FIRE DETECTORS--PYROLYTIC DEGRADATION PRODUCTS. *J. Fire Flammability, vol. 6:511-533, Oct. 1975. 12 refs.*

Performance data for commercial ionization and photoelectric type fire detectors for response to degradation products of important metal and non-metal mine fuels are presented. Exceptionally good performance is exhibited for Pyrotector SK 700 (a near infrared LED photoelectric detector). Based on the poor performance of ionization detectors to normal mining operations and ambient contaminants and the need for periodic cleaning, these devices are not recommended for use in metal or non-metal mines. Photoelectric detectors respond to the visible products of combustion from diesels and blasting or shot firing operations. Some other detection approach, such as gas sensing techniques, which are either insensitive to these operations or can discriminate between these and actual fire is required. Ambient concentrations, such as water mists and rock dust clouds, contribute to the false alarming characteristics of photoelectric detectors. (Author abstract modified)

57082 **APTIC NO. 81293**

Williams, Carolyn

THE DISTRIBUTION OF SULPHUR IN THE SOILS AND HERBAGE OF NORTH WEST PEMBROKESHIRE. *J. Agri. Sci., 84(3):445-452, June 1975. 16 refs.*

Sulfur was determined in soils sampled at 268 sites and in pasture plants samples at 172 sites in North West Pembrokeshire, Great Britain. Thhe S content of the topsoils ranged from 199 to 3392 mg/kg with a mean of 710 mg/kg. The S contents of the subsoils ranged from 115 to 1344 mg/kg with a mean of 356 mg/kg. Sulfur was concentrated in soils containing much organic matter. There was no clear relationship between plant and soil S contents, though soil drainage influenced both. Poorly drained soils were richer in S than well drained soils, whereas herbage on poorly drained soils accumulated less S than herbage growing on well drained soils. Herbage S contents ranged from 0.180 to 0.560%, with a mean

of 0.310%. If other factors are not limiting, 14% of the herbage sampled in Pembrokeshire had less than the critical S level recommended by other workers for maximum dry matter yield. (Author abstract modified)

1974

57083 **APTIC NO. 74422**

Andreini, Pierangelo, Ferruccio Ferrario, and Giorgio Sotgia

EXPERIMENTAL TESTS AND CONSIDERATIONS ON TWO NEWLY-DESIGNED PROBES FOR MEASUREMENT OF SOLID CONTENT IN GASES. *(Esperienze e considerazioni su due sonde di nuova conformazione per la misura del contenuto solid nei gas). Teext in Italian. Termotecnica (Milan), 28(9):464-468, Sept. 1974. 10 refs. (Presented at the National Congress of the Italian Termotechnica Association, 28th, Torino, Italy, Sept. 1973.)*

Two configurations for dust collection nozzles are described. The first allows both the determination of dust concentration in industrial smoke when used as a simple probe, and the measurement of the gas velocity when used as a double Pitot tube. The second configuration, of balanced type, has been tested in various shapes in order to improve its performance. Finally, an automatic adjustment system for the drawing of gas is proposed, which is suitable for both nozzles. This system has been thoroughly tested as a prototype. (Author abstract modified)

57084 **APTIC NO. 81296**

Ciccioli, Paolo, Giancarlo Goretti, Arnaldo Liberti, and Massimiliano Possanzini

THE DETERMINATION OF C9-C2O HYDROCARBONS IN THE ATMOSPHERE. *(Determinazione degli dr carburi C9-C20 nell atmosfera). Text in Italian. Ann. Chim. (Rome), 64(11-12):753-759, 1974.*

Organic vapors in industrial or urban atmospheres were determined through an active charcoal microfilter (3 cm by 0.5 cm). A volume of 50 liter of air was generally aspirated. The adsorbed compounds were extracted in order to obtain a suitable sample for gas chromatographic analysis.

57085 **APTIC NO. 81102**

Hara, Noboru

COLLECTION OF ATMOSPHERIC NH3 AND ITS DETERMINATION. *(Kichu NH3 no hoshu to teiryo). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Natl. Inst. Ind. Health), vol. 1974:55-56, 1974.*

The collection and determination of ammonia gas were undertaken using 0.5% orthoboric acid aqueous solution followed by the indophenol method. Several types of impingers filled with the HBO3 solution were used for the ammonia gas collection, and nearly 100% collection efficiencies were obtained by all impingers for NH3 concentrations from 1 to 100 ppm. For the collection of small amounts of air sample, a midget impinger was used. The collection efficiencies for 100 ppm NH3 were 90, 93, and 98%, when 5, 10, and 20 ml of absorbing solution were employed, respectively. The collection efficiencies decreased with increased NH3 concentration above 100 ppm levels and with decreased amounts of absorbing solution. The collection efficiencies were 40, 70, and 85% for 1000 ppm NH3 with 5, 10, and 20 ml of absorbing solution, respectively. The NH3 collection efficiency was not affected by sample air collection speed between 0.5 to 2.0 l/min. The determination of the collected NH3 by indophenol is highly sensitive, and requires an NH3 level in the solution of only 0.02 microgram/ml. The color of the solution is stable for more than 1 day. The determination of atmospheric NH3 levels of around 50 ppm is possible by the midget impinger with 10 to 20 ml HBO3 solution for 10 l air collection followed by the indophenol method.

57086 **APTIC NO. 78309**

Hayakawa, Morihiko, Yoji Naruse, and Toyomasa Kato

COMPARATIVE STUDIES OF STANDARD SO2 MEASUREMENT TECHNIQUES. *(Hanyo SO2 sokutei ho no hikaku kento). Text in Japanese. Nagoya-shi Kogai Kenkyusho HO (Rep., Environ. Pollut. Res. Inst. City Nagoya), no. 3:15-17, 1974. 6 refs.*

Atmospheric sulfur dioxide (SO2) was measured by three methods, and the experimental results were compared. These three methods, in common use, are: pararosaniline method (W-G method); solution electrical conductivity method (E-C method); PBO2 method. At low SO2 concentrations, anomalous results were otbained by using the E-C method. Even when no SO2 was detected by the W-G method, in standard gas treated with silica gel and activated carbon, the E-C method showed SO2 readings of 0.007 + or - 0.001 ppm. Results from W-G and E-C methods agreed at concentrations above 0.05 ppm, but below this, E-C methods gave consistently higher readings. Oxidant influence on W-G method was found to be negligible, when samples were allowed to stand for 30 minutes after sampling was taken. It was found that except for summertime, PbO2 measurements correlated well with data from E-C methods.

57087 **APTIC NO. 81413**

Homolya, James B.

COUPLING CONTINUOUS GAS MONITORS TO EMISSION SOURCES. *Chem. Technol., 4(7):426-433, July 1974. 7 refs.*

There are several approaches to continuously monitoring a gaseous source emission stream. The extractive approaches involve sample conditioning dependent not only upon the nature of the emission source, but also the detection technique being employed. The conditioning techniques include filtered probes, heated sample lines, water vapor removal systems, or a variety of dilution devices coupled to ambient air monitors. Dilution systems might offer the advantage that both ambient air and source monitoring could be accomplished by the same instrument. A recent investigation has demonstrated the viability of in situ monitoring for sulfur dioxide which, in effect, eliminates all sample conditioning. (Author abstract)

57088 **APTIC NO. 81245**

Honma, Katsunori

A CHARACTERISTIC EVALUATION OF A MEASURING DEVICE FOR PIEZO-CRYSTAL BALANCE TYPE AEROSOL WEIGHT MEASURING APPARATUS. *(Atsuden kessho tenbinshiki earozoru juryo nodo sokuteiki no tokusei hyoka). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Natl. Inst. Ind. Health), vol. 1974:59, 1974.*

The characteristics of the Particle Mass Monitor Model -3200 (Thermo-System Inc.) were evaluated. The relation between the weight and the monitor indicated frequency change was examined by depositing a known amount of copper on the detector, and by measuring its indicated frequency. The indicated frequency changed linearly with the copper weight between 2 to 200 micrograms. Measurement of indoor aerosol concentration using the monitor was made, and its measured value was compared to the value obtained by the direct weighing of the aerosol on the filter of a low volume air sampler. A correlation factor of 0.95 for the aerosol measurements by the Mass Monitor and the air sampler was obtained in the summer; however, the correlation factor obtained in winter measurement was 0.77. Thus the Mass Monitor only indicated half the actual aerosol concentration. By using the standard aerosols prepared from land fume and the methylene blue-uranyl-mixed dye, the effect of particle size and density on the monitor indicated aerosol concentration was examined. The linearity of the indicated frequency with the aerosol weight concentration became poorer with increasing particle size and with decreasing particle density, and this characteristic was also poorer for solid particles than for liquid particles. Since solid particles were more prevalent than liquid particles in winter, the poor correlation factor observed in the winter measurement is responsible for this phenomenon.

57089 **APTIC NO. 81468**

Junker, A. and G. Bergmann

SELECTION, COMPARISON AND VALUATION OF OPTIMUM WORKING CONDITIONS FOR QUANTITATIVE MULTI-COMPONENT ANALYSIS. PART I. TWO- DIMENSIONAL OVERDETERMINED SYSTEMS, SENSITIVITY AS OPTIMISATION PARAMETER. *(Auswahl, Vergleich und Bewertung optimaler Arbeitsbedingungen fuer die quantitative Mehrkomponenten-Analyse. I. Mitteilung. Zweidimensional ueberbestimmte Systeme, die Empfindlichkeit als Optimierungsparameter). Text in German. Z. Anal. Chem., 272(4):267-275, 1974. 9 refs.*

Calibration and analytical measurements in spectrometric multicomponent analysis can be solved by linear algebra, assuming the observed values to be a homogeneous linear function of the expected quantities. The increase of precision is one of the most important problems for the analyst. Using two-dimensional overdetermined systems of equations, precision can be extended up to the outer limits. Both the number of calibration samples and wavelengths should be higher than the minimum; in analysis the overdetermination in the number of wavelengths is sufficient. Two alternative ways of producing the amount of overdetermination by repetitive and additive measurements are discussed on the basis of information theory. The metric functional term sensitivity can be derived from the matrix of the system. There exists a statistical correlation between this term and the precision of analysis. A stepwise maximization procedure of the sensitivity in the system to be solved is used as a criterion of decision. (Author abstract)

57090 **APTIC NO. 81103**

Kamiyama, Nobuhiko and Hiroyuki Sakabe

STUDIES ON THE DETERMINATION OF FIBROUS MINERAL IN THE ENVIRONMENT, PART 1. *(Kankyochu no seni jyo kobutsu no keisoku ni kansuru kenkyu, 1). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Natl. Inst. Ind. Health), vol. 1974:61-62, 1974.*

The minimum detection limit and its accuracy for chrysotile, crocidolite, and amosite were determined by the X-ray diffraction technique. Each sample powder (2 micron) was fixed on a silver filter using a few drops of distilled water, and X-ray diffraction patterns were measured using a monochrometer with a rotary sample holder. The X-ray background signal was reduced to the 10% level of that observed when a glass or membrane filter was employed, and the signal to noise ratio increased. Since the silver filter was less affected by moisture compared to other filters, the in-coming X-radiation on the sample was stronger. The detection limit was improved by 1 or 2 orders of magnitude with respect to previous results reported by the X-ray diffraction technique. Calibration curves up to 0.002 mg/sq cm were prepared. To determine the asbestos level, the present technique requires 20 to 200 l of air sample for working environments and 200 cu m of air sample for ordinary environments.

57091 **APTIC NO. 74226**

Kirchhoff, W. H.

MEASUREMENT NEEDS IN AIR POLLUTION: A CASE FOR SPECTROSCOPY. *Preprint, 16p., 1974. (Presented at the Environmental Problems, Seminar Molecular Structure and Spectroscopy Symposium, Columbus, Ohio, June 11, 1974.)*

Federal reference methods for the analysis of the five gaseous pollutants for which primary air quality standards are promulgated (sulfur dioxide, nitrogen dioxide, photochemical oxidants (ozone), hydrocarbons (nonmethane), and carbon monoxide) are reviewed in terms of sensitivity and reliability. Only carbon monoxide is measured by a spectroscopic technique (nondispersive infrared spectrophotometry), and laboratory-to-laboratory standard deviations of about 10% are achieved with this method. A comparison of the various Federal reference methods indicates that CO measurements are the most reliable, making a case for spectroscopic techniques.

57092 **APTIC NO. 73136**

McSweeney, Albert

AN OPTICAL TRANSFORM TECHNIQUE FOR MEASURING THE SIZE DISTRIBUTION OF PARTICLES IN FLUIDS. *Nat. Bur. Stand. U. S. Spec. Publ., no. 412:89-96, Oct. 1974. 6 refs. (Presented at the National Bureau of Standards Seminar on Aerosol Measurements, Gaithersburg, Md., May 7, 1974.)*

An optical transform technique for the real-time measurement of particles in fluids is described. The technique is based on the use of a coherent optical processing system to measure the light intensity in the diffraction pattern due to a random group of particles. The light intensity as a function of radius is then inverted to yield a measure of the particle size distribution. The optical system consists of a laser and an optical detector that shows circular symmetry. The inversion process is reduced to a matrix multiplication in which a column matrix representing a set of light intensity data is multiplied by a rectangular inversion matrix to yield a column representing the particle size distribution. The technique may be applied to particles in gases, in liquids, or on microscope slides and is presently being directed toward the measurement of large particles (5-100 micron diameter) in the atmosphere. A significant advantage of the method is that the sample volume may be large, thus removing the need to pipe the sample through small tubes.

57093 **APTIC NO. 81583**

Northam, G. Burton, James M. Rosen, S. Harvey Melfi, T. J. Pepin, M. P. McCormick, D. J. Hofmann, and William H. Fuller, Jr.

DUSTSONDE AND LIDAR MEASUREMENTS OF STRATOSPHERIC AEROSOLS: A COMPARISON. *Appl. Opt., 13(10):2416-2421, Oct. 1974. 10 refs.*

Comparative measurements of stratospheric aerosol profiles were made on two nights in mid-September of 1972 over Laramie, Wyoming using balloonborne particle counters (dustsonde) and remote ground-based light detection and ranging (lidar) techniques. Lidar backscattering and particle number density profiles correlated well when the measured atmospheric molecular density profile was used to calculate the Rayleigh profile employed in the lidar data reduction. The backscattered signal at 20 km was approximately 18% above Rayleigh and corresponded to a measured concentration of about 1 particle/cu cm for diameters greater than 0.30 micron. Ground-based lidar appears to be a feasible method for determining the relative aerosol profile under present stratospheric conditions, assuming that the nearest rawinsonde density profile is used in the normalization of the lidar data until lidar systems are developed to measure the molecular profile directly. (Author abstract modified)

57094 **APTIC NO. 81221**

Seals, R. K., Jr.

ANALYSIS OF TUNABLE LASER HETERODYNE RADIOMETRY: REMOTE SENSING OF ATMOSPHERIC GASES. *AIAA (Am. Inst. Aeron. Astronaut.) J., 12(8):1118-1122, Aug. 1974. 16 refs. (Presented aht AIAA Fluid and Plasma Dynamics Conference, 6th, Palm Springs, Calif., July 16-18, 1973, Paper 73-703.)*

A theoretical computer analysis of high spectral resolution remote sensing of atmospheric gas profiles with a tunable infrared laser heterodyne radiometer at satellite altitudes is presented. Individual atmospheric emission lines can be scanned. The advantages of a tunable laser local oscillator are indicated along with the feasibility of diode lasers for such use. The capability of this system for measurements of the vertical distributions of atmospheric water vapor and methane between 0 and 30 km altitude is illustrated by numerical retrievals of distribution profiles and simulated radiance data in the 7 to 8 micron spectral region. Error analyses using expected radiometer signal-to-noise errors, temperature bias errors, and ground temperature errors indicate that retrieval profiles with less than 20% average error can be obtained. The calculations used a model atmosphere typical of midlatitude summer conditions and assumed scattering effects to be negligible. (Author abstract modified)

57095 **APTIC NO. 81248**

Soda, N. and T. Takano

STUDIES ON THE CONDITION OF GAS CHROMATOGRAPHY AND COLLECTION-BAG FOR VINYL CHLORIDE MONOMER ANALYSIS. *(Enka biniru monoma bunseki no tameno gasu kuromato gurafu joken to hoshubukuro no kento). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Na'l. Inst. Ind. Health), vol. 1974:52-53, 1974.*

Vinyl chloride analysis using a sample collection bag was studied by gas chromatography. Both polyfluorovinylidene bags and Akuron (co-polymer of ethylene and tetrafluoroethylene) bags were tested as collection bags for vinyl chloride monomer. A standard vinyl chloride monomer gas was put in each bag by the permeation tube method, and the decrease in the vinyl chloride monomer concentration within the bags was examined over 13 days by GC equipped with hydrogen flame ionization detector. The loss of vinyl chloride in the Akuron bag was large, while the vinyl chloride in the polyfluorovinylidene bag was retained for 6 days without apparent loss. The 1.42 ppm vinyl chloride concentration in the Akuron bag decreased to 1.11 and 0.72 ppm after 6 days and 13 days respectively, while the vinyl chloride in the polyfluorovinylidene bag was 1.36 ppm after 13 days. The GC column material used was Porapak Q and Chromosorb 101 at temperature 100 C with nitrogen gas at a flow rate of 50 ml/min. With this condition, the analytical reproducibility was better than 0.5 ppm. The detection limit was 0.2 ppm with a signal to noise ratio of 5.

57096 **APTIC NO. 81290**

Winer, Arthur M., John W. Peters, Jerome P. Smith, and James N. Pitts, Jr.

RESPONSE OF COMMERCIAL CHEMILUMINESCENT NO-NO2 ANALYZERS TO OTHER NITROGEN-CONTAINING COMPOUNDS. *Environ. Sci. Technol., 8(13):1118-1121, Dec. 1974. 12 refs.*

The response of commercial chemiluminescent nitric oxide-nitrogen dioxide analyzers to other nitrogen-containing compounds was investigated. Several of the analyzers were nonspecific for NO2 and NO, with determinations actually reflecting the sum of NO2, peroxyacetyl nitrate, and a variety of other organic nitrates as well as organic nitrites. In addition, the analyzers responded nonquantitatively to compounds such as nitroethane and nitric acid. Although the implications of these observations are not serious in the case of most ambient air analyses were concentrations of PAN seldom rise above 40 ppb and concentrations of organic nitrates and nitrites and nitric acid are between 0 and 10 ppb, significant corrections may be necessary for highly quantitative ambient air studies where relatively low concentrations of NO2 occur simultaneously with high concentrations of interfering compounds. (Author conclusions modified)

1973

57097 **APTIC NO. 81579**

Goldman, A., D. G. Murcray, F. H. Murcray, W. J. Williams, and J. N. Brooks

DISTRIBUTION OF WATER VAPOR IN THE STRATOSPHERE AS DETERMINED FROM BALLOON MEASUREMENTS OF ATMOSPHERIC EMISSION SPECTRA IN THE 24-29-MICRON REGION. *Appl Opt., 12(5):1045-1053, May 1973. 54 refs.*

The distribution of water vapor in the stratosphere was determined from balloon measurements of atmospheric emission spectra in the 24-29-micron region. Observed radiances were fitted to line-by-line, layer-by-layer radiance calculations from which the water vapor mixing ration between 10 and 30 km were derived. The resulting mixing ratio altitude profiles showed a broad minimum around 15 km and a broad maximum around 25 km, with a range of values of from 0.0000006-0.000004 g/g. The observed maximum indicated a relatively wet atmospheric layer near 25 km which might be related to photochemical processes in the ozone, nitric acid, nitrogen dioxide layer. The spectral radiance method is not limited to water vapor and can be applied to the measurement of other minor atmospheric constituents.

57098 **APTIC NO. 81386**

Zdrojewski, A., N. Quickert, and I. Dubois

THE ACCURATE MEASUREMENT OF CADMIUM IN AIRBORNE PARTICULATES. *Int. J. Environ. Anal. Chem., 2(4):331-341, 1973. 10 refs. (Presented at the Recent Advances in the Analytical Chemistry of Pollutants Symposium, Halifax, Nova Scotia, Aug. 23-25, 1972.)*

The accurate and rapid measurement of cadmium in airborne particulates is described, with particular reference to high volume air samples collected on glass fiber filters. The method involves the acid digestion of a part of the filter followed by analysis using atomic absorption spectroscopy. The Cd determinations were free of matrix error and small interferences by other elements could be accurately taken into account. For a typical air sample of 2000 cu m, the Cd amount was determined with accuracy down to 2 ng/cu m. Determinations below this level were possible at the expense of the speed and simplicity of the method. The possibility of a non-uniform distribution of Cd on the exposed filter, and the change of accidental contamination of the filter or prepared sample by traces of Cd are discussed. (Author abstract modified)

1972

57099 **APTIC NO. 78567**

Holmes, S.

SAMPLING METHODS. *International Agency for Research on Cancer, Intern. Agency Res. Cancer Conf., Lyon, France, 1972, p. 109-112. 7 refs. (Oct. 2-6.)*

Techniques for the sampling and identification of asbestos fibers are reviewed. The combination of membrane filter sampling and optical microscope analysis appears to be the best system for monitoring asbestos dust in occupational environments. Mass estimation methods such as X-ray diffraction, electron microscopy, atomic absorption spectrometry, and infrared analysis are sutiable for assessing the asbestos content of the general environment. Such methods possess the advantage of rapidity, though they cannot be adopted with confidence, particularly for chrysotile, until a reliable elutriation system is available. The most promising mass estimation method is X-ray diffraction which allows for measurements of as little as 10 micrograms of chrysotile asbestos in samples where the asbestos represents only 10% of the total mass.

57100 **APTIC NO. 81176**

Honma, K.

MEASUREMENT OF MIST UTILIZING REACTION OF TRAPPED SURFACE. *(Hoshumenjo ni okeru hanno o riyo shita misuto no sokutei hoho). Text in Japanese. In: Special Report Concerning Clarification of Photochemical Smog Phenomena. Research Coordinating Bureau, Science and Technology Agency, p. 116-135, 1972.*

New methods capable of measuring sulfuric acid mists in short periods of time are described. A pH filter paper, made by dyeing an aerosol filter with a pH indicator, has been used. The use of pH testing film (photographic film from which silver is eliminated) is also discussed. A third study was made of the use of a metal film applied to a glass sheet by a vacuum steaming method. The area of corrosion by sulfuric acid mist was checked by a colorimeter to measure the sulfuric acid trapped on the metal film. The third method reacts with sulfuric acid mist selectively, and has an [illegible] 1 microgram sensitivity.

57101 **APTIC NO. 81052**

McKee, Herbert C., Ralph E. Childers, Oscar Saenz, Jr., Thomas W. Stanley, and John H. Margeson

COLLABORATIVE TESTING OF METHODS TO MEASURE AIR POLLUTANTS. I. THE HIGH-VOLUME METHOD FOR SUSPENDED PARTICULATE MATTER. *J. Air Pollution Control Assoc., 22(5):342-347, May 1972. 9 refs.*

The high-volume method for measuring total particulate matter was evaluated in field studies. The relative standard deviation (coefficient of variation) for single analyst variation (repeatability of the method) was 3%. The relative standard deviation for interlaboratory variation (reproducibility) of the method was 3.7%. The minimum amount of particulate matter detectable by this method was 3 mg (95% confidence level). This is equivalent to 1-2 microgram/cu m for a 24-hour sample. Values this low are rarely observed in the atmosphere. Lack of sensitivity does not limit this method for measurement of ambient air quality. (Author abstract modified)

57102 **APTIC NO. 81177**

Nakamura, K. and H. Hada

STUDY OF MAKING MODEL OF CONTINUOUS MEASURING APPARATUS OF SULFURIC ACID MIST IN ATMOSPHERE. *(Taikichu no ryusan misuto renzoku sokutei sochi no shisaku kenkyu). Text in Japanese. In: Special Report Concerning Clarification of Photochemical Smog Phenomena. Research Coordination Bureau, Science and Technology Agency, p. 199-212, 1972.*

In order to trap sulfuric acid mist, a mist condensation method was developed. The principle of measurement is based on a solution electric conductivity ratio method. The mist catcher has an efficiency of 98%. The mist catcher is cleaned with 90% iso-prophyl alcohol. The device should be kept at 60 C constantly. About 1/100 of the sulfur dioxide concentration in the sulfuric acid mist is measured. By accumulating these results, the relationship between SO2 and sulfur trixide and the generation of various pollutants and SO2 can be studied. Since the apparatus is based on the fact that when sulfuric acid mist is 100-200 mg/cu m the trapping efficiency is more than 98%, kinetic corrections must be made when the volume is smaller. By adding SO3, the sulfuric acid mist can be adjusted, but it is difficult to obtain unified particle diameters. Water-soluble conductors, may interfere with this measurement method.

1971

57103 **APTIC NO. 74597**

Smal, Zbigniew

INVESTIGATIONS OF DETERMINING LEAD IN AIR BY MEANS OF IONIZING RADIATION METHOD. *(Badania nad oznaczaniem olowiu w powietrzu przy usyciu promieniowania jonizujacego). Text in Polish. Prace Central. Inst. Ochrony Pracy, 21(70):185-191, 1971. 8 refs.*

Radiometric methods for the determination of lead in air were investigated. Equipment for collecting lead from the air and establishing the efficacy of collecting lead vapors in nitric acid solution were also investigated. Ionizing radiation sources used were strontium-90 and yttrium-90 in the form of flat disks (6 mm diameter) and thallium-170 (0.5 curie activity) and gadolinium-153 (15 millicurie activity) in the shape of cylinders with a 6 mm diameter. The effect of silicon and zinc impurities on the determination of lead in nitric acid solution was also investigated. Graphs illustrating the dependency of lead detection on mixture concentrations were prepared. Strontium-90 and yttrium-90 did not give satisfactory results. Better results were obtained with thallium-170 as the radioactive source, and best results were obtained with gadolinium-153. Filters that cut off part of the radiation or electronic devices for the same purpose must be used to achieve complete efficiency of analysis.

AIR QUALITY MEASUREMENTS

1976

57104 **APTIC NO. 81632**

Cunningham, P. T. and S. A. Johnson

SPECTROSCOPIC OBSERVATION OF ACID SULFATE IN ATMOSPHERIC PARTICULATE SAMPLES. *Science, 191(4222):77-79, Jan. 9, 1976. 14 refs.*

Infrared spectra of time and size classified atmospheric particulate samples collected with an inertial impactor revealed the presence of acid sulfate in the submicron sized fraction. Significant variations in the sulfate bands occurred for a number of samples collected in Chicago and St. Louis. These spectral variations were attributed to changes in the degree of acidity of the samples. The acidic nature of the particles was observed at all times of the day and persisted for several days in urban areas. (Author abstract modified)

57105 **APTIC NO. 81448**

Demuynck, M., K. A. Rahn, M. Janssens, and R. Dams

CHEMICAL ANALYSIS OF AIRBORNE PARTICULATE MATTER DURING A PERIOD OF UNUSUALLY HIGH POLLUTION. *Atmos. Environ., 10(1):21-26, 1976. 17 refs.*

Airborne particulates were sampled daily in Ghent, Belgium before, during, and after a period of unusually high particulate loading during September 1972. The collected aerosols were chemically analyzed for 44 components, and the concentrations of nearly all of the determined components were grouped in terms of source of origin. Nearly all of the components increased by at least a factor of 8 and afterwards dropped to the original levels under the influence of atmospheric conditions. Elements clearly displaying an anthropogenic origin (stationary and mobile sources) included: copper, zinc, arsenic, selenium, bromine, silver, cadmium, indium, antimony, gold, mercury, lead, aluminum, silicon, iron, cobalt, barium, thorium, calcium, potassium, manganese, titanium, and phosphate. (Author abstract modified)

AIR QUALITY MEASUREMENTS

57106

APTIC NO. 81608

Flocchini, Robert G., Thomas A. Cahill, Danny J. Shadoan, Sandra J. Lange, Robert A. Eldred, Patrick J. Feeney, Gordon W. Wolfe, Dean C. Simmeroth, and Jack K. Suder

MONITORING CALIFORNIA S AEROSOLS BY SIZE AND ELEMENTAL COMPOSITION. *Environ. Sci. Technol., 10(1):76-82, Jan. 1976. 9 refs.*

A system for the collection of aerosol samples and elemental analysis by ion-excited X-ray emission was developed. It has provided an accurate and cost-effective method for monitoring of sodium and heavier elements in aerosols present in California. Two-stage impactors with after-filters provided for particle sizing, operating of flow rates of 0.5 to 1.0 cfm. Normally, 24-hour samples were taken in the size ranges 0.1 to 0.65, to 3.6, and 3.6 to 20 micron effective aerodynamic diameter at unit density. Most analyses were performed using 18-mega electron volt alpha particle beams from a cyclotron, although X-ray fluorescence, scanning electron microscope, and microprobe techniques were also used. Once results were present in an array for each size range, with all particle collection and analytical corrections included, elements were correlated one to another within each size range. Uses of these outputs are presented. (Author abstract)

57107

APTIC NO. 81443

Hardy, Kenneth A., Roland Akselsson, John W. Nelson, and John W. Winchester

ELEMENTAL CONSTITUENTS OF MIAMI AEROSOL AS FUNCTION OF PARTICLE SIZE. *Environ. Sci Technol., 10(2):176-182, Feb. 1976. 11 refs.*

Proton-induced X-ray emission analysis of aerosol samples taken from Miami, Florida in the summer of 1974 was performed to investigate elemental composition as a function of particle size. Airborne particulate matter in south Florida appeared to be close to natural levels, except at the most urbanized sampling sites, with the exception of lead and bromine which were generally of automotive pollution origin. High values of elements in large particle size fractions were attributed to soil dust in urban areas. Elements attributable to combustion sources appeared to be possibly enhanced in the small particle range (respirable) and included sulfur, lead, bromine, chlorine, nickel, zinc, manganese, and vanadium. Calcium, potassium, titanium, iron, and large-particle chlorine were attributed to sources derived from soil dust (raised by urban activity) or sea spray. The aerosol in Miami is susceptible to modification by the introduction of catalytic converters for automotive emission control and to increase in the combustion of fossil fuels.

57108

APTIC NO. 81423

Heindryckx, R.

COMPARISON OF THE MASS-SIZE FUNCTIONS OF THE ELEMENTS IN THE AEROSOLS OF THE GENT INDUSTRIAL DISTRICT WITH DATA FROM OTHER AREAS. SOME PHYSICO-CHEMICAL IMPLICATIONS. *Atmos. Environ., 10(1):65-71, 1976. 29 refs.*

A comparison of the mass-size functions of elements determined in aerosols of the Gent, Belgium industrial area with data from other areas revealed a striking reproducibility. Sodium, magnesium, aluminum, scandium, calcium, titanium, chromium, iron, cobalt, copper, cerium, samarium, and thorium were mainly associated with particles having mass median diameters larger than 1 micron; whereas chlorine, potassium, vanadium, manganese, zinc, selenium, arsenic, bromine, indium, antimony, iodine, cesium, and mercury were associated mainly with particles smaller than 1 micron in diameter. An inverse relationship between the mass median diameter and the enrichment factor of the element in the aerosol versus the average soil composition was possibly due to the volatility of the elements and their compounds. A departure of the size distribution of many elements from the Junge mass distribution for the total continental aerosol was most likely due to local emissions by high temperature processes and the fact that the aerosol did not pass through an aging process. A broad and consistent peak for manganese was observed for aerosols collected near a ferromanganese plant. (Author abstract modified)

57109

APTIC NO. 81450

Kadowaki, Satoshi

SIZE DISTRIBUTION OF ATMOSPHERIC TOTAL AEROSOLS, SULFATE, AMMONIUM AND NITRATE PARTICULATES IN THE NAGOYA AREA. *Atmos. Environ., 10(1):39-43, 1976. 19 refs.*

Particle size distribution measurements of total aerosols, sulfate, ammonium, and nitrate were made in Nagoya, Japan. The size distribution of the total aerosol comprised two different populations, one on natural origin and the other originating from anthropogenic sources (combustion products). Sulfate and ammonium were predominantly associated with submicron particles, and the size distributions were in good agreement with those portions of the total aerosol population originating from anthropogenic sources. The nitrate size distribution was bi-modal like that of the total aerosol population. Sub-micron particles dominated the nitrate distribution in the winter but not in the summer. (Author abstract modified)

57110

APTIC NO. 81446

Kleinman, M. T., T. J. Kneip, and M. Eisenbud

SEASONAL PATTERNS OF AIRBORNE PARTICULATE CONCENTRATIONS IN NEW YORK CITY. *Atmos. Environ., 10(1):9-11, 1976. 8 refs.*

Total suspended particulate measurements over New York City for the 2-year period 1972-1974 were analyzed for possible seasonal patterns. The measurements were normalized for the effects of wind speed and the height of the atmospheric mixing layer. Emissions were increased during the winter months, presumably due to the combustion of oil for space heating. This source appeared to contribute an average of 40% of the total suspended particulate loading during the winter and about 10-30% of the annual average total suspended particulates. (Author abstract modified)

57111

APTIC NO. 81556

Mainwaring, Sylvia J. and Shri Harsha

SIZE DISTRIBUTION OF AEROSOLS IN MELBOURNE CITY AIR. *Atmos. Environ., 10(1):57-60, 1976. 13 refs.*

The size distribution of particles in the urban air of Melbourne, Australia was studied using a high volume sampler in conjunction with an Anderson cascade impactor. Measurements were conducted at several heights above street level ranging from 11.6-66.4 m. No variation in size composition with height was observed. The particle size distribution was bimodal, with two maxima occurring between 0.1 and 1.5 micron (diameter) and 5.0 and 50 micron. The most interesting feature of the Melbourne aerosol was the predominance of larger size particles (greater than 2 micron); the composite mass median diameter value for Melbourne was significantly higher than values reported for other cities. (Author abstract modified)

57112

APTIC NO. 81422

Van Valin, C. C., R. F. Pueschel, F. P. Parungo, and R. A. Proulx

CLOUD AND ICE NUCLEI FROM HUMAN ACTIVITIES. *Atmos. Environ., 10(1):27-31, 1976. 14 refs.*

Physical and chemical properties of aerosols over the Denver, Colorado area were measured during November 1973. Light scattering and the atmospheric concentration of cloud condensation nuclei were directly and positively correlated with pollution intensity, and the formation of cloud condensation nuclei and light scattering particles was accelerated by sunlight. The natural production of ice nuclei during windy periods greatly exceeded man-made production during pollution episodes. The fraction of aerosol particles containing lead increased during a pollution episode. Lead, chlorine, and bromine were found mostly in particles smaller than about 0.5 micron in diameter; these particles may coagulate with larger and predominantly siliceous particles.

57113 **APTIC NO. 81497**

Verma, Shashi B. and Norman J. Rosenberg

CARBON DIOXIDE CONCENTRATION AND FLUX IN A LARGE AGRICULTURAL REGION OF THE GREAT PLAINS OF NORTH AMERICA. *J. Geophys. Res., 81(3):399-405, Jan. 20, 1976. 31 refs.*

Data on carbon dioxide concentration and flux in a large agricultural region of the Great Plains of North America (Mead, Nebraska) were obtained. The observations were made at sufficient heights to represent an integration of CO2 fixation and release due to all types of land use in the region. Daytime CO2 ranged from about 295-300 ppm during late July to early August to 328-332 ppm during the winter months. The peak daytime fluxes (in g times 10 to the -7/sq cm/sec) varied from about 0.5 in early June to 1.5-2.0 in late July to early August and 0.5 in late September. The minimum annual CO2 concentration was observed around late July. Carbon dioxide flux rates reached a maximum during the same period, suggesting a distinct peak in photosynthetic activity in the region at this time. This peak was hypothesized as being due to the coincidence with a maximum biomass in the annual crops of the region. The annual cycle of CO2 concentration observed at Mead was compared with that at Barrow, Alaska, and Mauna Loa, Hawaii; and the minimum in CO2 concentration at Mead was relatively sharp and intense compared with those at the other locations. (Author summary modified)

1975

57114 **APTIC NO. 81615**

Anlauf, K. G., M. A. Lusis, H. A. Wiebe, and R. D. S. Stevens

HIGH OZONE CONCENTRATIONS MEASURED IN THE VICINITY OF TORONTO, CANADA. *Atmos. Environ., 9(12):1137-1139, 1975. 6 refs.*

Airborne measurements of ozone, nitric oxide, and nitrogen dioxide were made over Lake Ontario during the period August 6 to October 24, 1974. The monitoring location was about 3 km off-shore from the southern side of the Toronto urban complex and was virtually free of local sources of pollution. High ozone concentrations were observed, especially during the month of August. The Canadian maximum acceptable standard for oxidants (0.08 ppm hourly average) was exceeded 49% of the time during daylight hours during August. High ozone concentrations (and low nitrogen oxide concentrations) were almost always observed when the wind was blowing from Lake Ontario. Substantially lower ozone levels (accompanied by higher nitrogen oxide concentrations) were generally observed when the winds were from the direction of downtown Toronto. A strong positive correlation was observed between high ozone concentrations and maximum daily temperature. The high ozone concentrations appeared to be due to a process involving the transport of ozone towards Toronto rather than its local photochemical production.

57115 **APTIC NO. 81172**

Chaloner, C. P., J. R. Drummond, J. T. Houghton, R. F. Jarnot, and H. K. Roscoe

STRATOSPHERIC MEASUREMENTS OF H2O AND THE DIURNAL CHANGE OF NO AND NO2. *Nature (London), 258(5537):696-697, Dec. 25, 1975. 16 refs.*

A radiometer was flown from a balloon, which senses infrared emission from minor stratospheric constituents on the atmospheric limb. The optical system contained beam splitters which divided the radiation between 3 channels with superimposed fields of view. Each contained an interference filter which selected the emission band, a cell of the gas to be measured, and an infrared detector. The three channels measured emission from nitric oxide near 1900/cm, nitrogen dioxide near 1600/cm, and water vapor from 500 to 200/cm. The sensitivity of the radiometer to each gas was determined in the laboratory by measuring the absorption of the gas in a cell. Some results are presented from two flights from southern France. The radiometer remained at its float altitude near 37 km for 5 and 7 hr respectively, drifting almost due west towards 44 deg North, 0 deg East on each flight. The increase in water vapor mixing ratio between 25 and 35 km was at least a factor of 1.9; the results cannot be interpreted as a constant water mixing ratio. The later flight gave the first simultaneous measurements of changes in stratospheric NO and NO2 from night to day. The nighttime concentration of NO was barely detectable relative to instrument noise, and was probably less than 0.8 times 10 to the -9th power by volume. The NO2 values were also somewhat larger than those obtained by solar absorption spectroscopy: they dropped from 35 to 16 times 10 to the -9th power by volume at a height of 36 km. The sum of NO and NO2 concentrations remained constant from night to day within the errors of the analysis so far achieved.

57116 **APTIC NO. 81366**

Dams, R., J. Billiet, C. Block, M. Demuynck, and M. Janssens

COMPLETE CHEMICAL ANALYSIS OF AIRBORNE PARTICULATES. *Atmos. Environ., 9(12):1099-1106, 1975. 23 refs.*

Airborne particulate material collected during several winters in Milan was homogenized and distributed for intercomparison. Chemical analysis of a sample of this material is reported. Using thermal, epithermal, and fast neutron activation analysis; flameless atomic absorption spectrometry; spectrophotometry; organic extraction; combustion; and gravimetric techniques, 53 components were determined quantitatively. The reproducibility was better than 20% for most components. Summation of the determined components gave 100.5 + or - 1.9%. The sample was also ashed and the residual ash chemically analyzed for 43 components. Nearly all metals were not significantly volatilized, while hydrogen, nitrogen, carbon, oxygen, the halogens, selenium, and mercury were completely or largely volatilized during ashing. (Author abstract modified)

57117 **APTIC NO. 74737**

Endo, Ryousaku, Tetsutaro Kohgo, Hiroshi Shirakawa, Tatsunori Oyake, Hiroshi Matsumoto, Toshiaki Nakajima, and Motoi Kamada

ON THE INVESTIGATION OF ENVIRONMENTAL POLLUTION BY AUTOEXHAUST AND THE INVESTIGATION OF INHABITANTS CONSCIOUSNESS AND THEIR PHYSICAL INFLUENCE BY AUTOEXHAUST. *(Hidosha haishutsu gas ni yoru kankyo osenchosa to jumin ishiki narabini shintai eikyo chosa ni tsuite). Text in Japanese. Hokkaido Kogai Boshi Kenkyusho-ho (Rep. Hokkaido Res. Inst. Environ. Pollut.), no. 1:57-67, March 1975. 11 refs.*

Air pollution due to automobile exhaust was investigated at crossings with heavy traffic in Otaru, Kushiro, Obihiro, and Asahikawa in the summer of 1970. Examinations of inhabitants living near the crossings were also performed. The concentration of carbon monoxide was highest at a crossing in Otaru, exceeding the standard, followed by that at a crossing in Kushiro, approximating the standard. The percentage of health complaints was high in Otaru and Kushiro, about 40%. The most frequent complaint was an unpleasant feeling, followed by headache, pharyngo-bronchitic symptoms, ocular, and heart symptoms.

57118 **APTIC NO. 81110**

Forwerk, Walter

RESULTS OF OFFICIAL INVESTIGATIONS: GAPS OF IMMISSION PROTECTION. *(Ergebnisse behoerdlicher Untersuchungen: Luecken des Immissionsschutzes). Text in German. Wasser Luft Betrieb, 19(8):467, 1975. 2 refs.*

An emission survey conducted in the Frankfurt am Main area revealed highest air pollutant concentrations in the downtown area with the highest population density, and substantially lower concentrations in the vicinity of industrial, even chemical plants. Therefore, air pollution prevention is most needed in urban areas, while exaggerated emission control measures in industry are a waste of money. These priorities should be duly considered in clean air maintenance planning.

57119 APTIC NO. 81071

Grimmer, G. and H. Boehnke

PROFILE ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS AND METAL CONTENT IN SEDIMENT LAYERS OF A LAKE. *Cancer Lett., 1(2):75-83, Nov. 1975. 8 refs.*

The formation of polycyclic aromatic hydrocarbons (PAH) in the annual sediment layers of a lake was investigated to determine if they result from air dust pollution. Sample layers taken from drilling cores going back to 1915 showed no significant differences at the forest shore (no buildings) during this period. In contrast, samples taken from a built-up area of the shore (with a highway and a main railway line) showed five times the amount of PAH today compared with 1915. The same trend was observed in the content of zinc, whereas lead, iron, chromium, nickel, copper, and manganese levels were constant. Identification or characterization of PAH was accomplished by comparison of the retention times and mass spectrometry of authentic compounds. Sixty-four PAH are described. The burden of carcinogenic PAH air pollution pollutants has increased fivefold from 1915-1970. (Author abstract modified)

57120 APTIC NO. 73102

Hudson, J. L., J. J. Stukel, and R. L. Solomon

MEASUREMENT OF THE AMBIENT LEAD CONCENTRATION IN THE VICINITY OF URBANA-CHAMPAIGN, ILLINOIS. *Preprint, Illinois Univ., Urbana, Dept. of Chemical Engineering, 27p., 1975. 24 refs.*

Atmospheric lead concentrations were measured as a function of both time and position in a rural area adjacent to Urbana-Champaign, Illinois during the period August 1973 to February 1974. The results were related to traffic and meteorloigical data with a mathematical model for the transport of lead particulates from local sources. The mean rural concentration of lead was 0.227 micrograms/cu m with a standard deviation of 0.116 micrograms/cu m. Most of the lead was transported into the rural area from distant sources; the contribution of automobiles in the Urbana-Champaign area and along local highways was minor. The average mass median equivalent diameter of the rural aerosol was 0.42 micron with a geometric standard deviation of 4.14. The composite deposition average was 1.91 mg/sq m/mo. (Author abstract modified)

57121 APTIC NO. 74751

Ishizaka, Takashi and Kenji Isono

DISTRIBUTION OF AEROSOLS IN URBAN ATMOSPHERES. I. *(Toshi taiki chu no aerosol no bunpu. I). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 72, 1975. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

Aircraft measurements of the concentration, kind, and elemental composition of aerosols present in the upper sky of the Tokai district were made. The airplane flew over Nagoya, Yokkaichi, Okazaki, and Ise Bay on December 11, 1974. The wind direction was northwest. The flight altitude was 3000 ft. Aerosols were also collected at the same time on the campus of Nagoya University. An examination of the horizontal distribution of aerosol particles larger than 0.4 micron in diameter showed that the concentration was high in the sky downstream of cities. The concentration was 1.9-2.4 particles/cc directly over the cities and about 3.3 particles/cc in the sky downstream of the cities. Electron microscopic observation revealed that the particles originated from human activities. The aerosol particles collected on the earth consisted of iron chloride, sodium chloride, and carbon; whereas those collected over the sea consisted of NaCl. The presence of FeCl2 was attributed to the reaction between iron particles emitted from steel making factories and chlorine gas liberated from chemical factories.

57122 APTIC NO. 81334

Isono, Kenji and Takashi Ishizaka

AEROSOL OVER THE SOUTH-WEST ISLANDS IN WINTER. (AMTEX 1975). *(Toki nansei shoto jyoku no earozoru (AMTEX 1975)). Text in Japanese. Preprint, Meteorological Society of Japan, Tokyo, p. 149, 1975. (Presented at the Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975.)*

The aerosol concentrations, configuration, humidity characteristics, chemical composition, and material composition of aerosol sampled over the South-West islands (2000-9000 ft) on Feb. 26, 1975 were analyzed. The vertical distribution of oceanic salt grains, amount of transported soil and pollutant, correlation between oceanic salt and other substances, and aerosol composition in the free atmosphere were investigated. The aerosol in the lower atmosphere was suspended in liquid phase at normal humidity. The weight ratio of sodium and sulfur at 2000 ft was similar to the Na-S ratio of sea water, indicating that the aerosol at this altitude was composed primarily of oceanic salt grains. Small amounts of soil particles (Si) and pollutants (S) were also found. The concentration of oceanic salt grain decreased rapidly at altitudes above 5000-6000 ft, however, the weight concentrations of S and Si increased above 7000 ft, which, indicated an accumulation of transported pollutants under the inversion layer.

57123 APTIC NO. 81133

Jaworowski, Z., J. Bulkiewicz, and E. Dobosz

STABLE AND RADIOACTIVE POLLUTANTS IN A SCANDINAVIAN GLACIER. *Environ. Pollut., 9(4):305-315, Dec. 1975. 30 refs.*

Concentrations of radium-226, lead-210, uranium, cadmium, and cesium-137 were determined in the fossil and contemporary ice samples from Storbreen glacier in Norway. Low concentrations of Cs-137 were found in the samples from the 19th, 16th, and 12th centuries. This ice was contaminated by contemporary fallout, to a depth of about 50 cm below the surface. Concentrations of Ra-226 ranging from 0.0025 to 0.078 pCi/kg were found from the 12th century to 1972. Concentrations of Cd and stable Pb increased during the past 800 yr. In the case of Cd this increase started late in the 19th century whereas the Pb concentrations around the year 1600 were already higher than around 1200. The Cd concentrations in ice increased rapidly during the last decade. Peak concentrations of Cd coincided more or less with those of Pb, which suggests a common source of both pollutants. During the past two decades the mean concentration of U in Storbreen ice is one order of magnitude higher than in the 12th century. The long distance migration of Pb pollutants in the atmosphere was confirmed, whereas atmospheric dispersion of Ra proved to be generally local.

57124 APTIC NO. 81144

Johnson, David L. and Robert S. Braman

ALKYL- AND INORGANIC ARSENIC IN AIR SAMPLES. *Chemosphere, 4(6):333-338, Dec. 1975. 12 refs.*

The results of investigations into the forms of arsenic in air are presented. A two component collector was used, the first stage collecting particles larger than 0.3 micron, the second collecting volatile arsines, arsenic trioxide vapor, and fine particulates. Quantitative removal of the arsines without dealkylation or disproportionation was achieved with a mild, warm alkaline wash followed by a hot water wash. The glass fiber filters were homogenized in a dilute alkaline medium before analysis. The aqueous solutions resulting from this treatment were analyzed for arsenic by a technique involving direct current discharge and emission spectroscopy. Total arsenic in the outdoor samples averaged 1.7 times 10 to the -9th power g/cu m. The indoor samples, though heavily biased toward environments containing plants, showed much higher average total arsenic levels, greater than 8 times 10 to the -9th power g/cu m. There may be two different general sources for arsenic in air: nonbiological processes, both natural and anthropogenic, producing inorganic particulates, and biological process which release volatile alkyl arsenic compounds. Vapor phase alkyl arsenic/particulate reactions may provide a widespread natural mechanism for arsenich enrichment in aerosol samples. The results of 29 analyses for arsenic species in various samples are given.

57125 **APTIC NO. 81574**

Karasawa, N.

PHOTOCHEMICAL SMOG AT YOKKAICHI CITY IN 1974. *(1974 nenno Yokkaiichi-shi no kikagaku sumogu). Text in Japanese. Tokyo Kanku Chiho Kisho Kenkyukai-shi (Geophys. Notes Tokyo Dist. Meteorol. Obs.), no. 8:76-77., Sept. 1975.*

The photochemical smog in Yokkaichi city with its huge petrochemical complex is reviewed with data obtained in 1974. Sulfur oxide concentration is decreasing, and no emergency warnings concerning SO2 were issued since January 1972. The number of smog forecasts issued in 1974 was 20 (above 0.1 ppm), and there were seven smog alarms (above 0.15 ppm). The data on forecasting and warning issuance, oxidant concentration, and meteorological conditions are compiled. The data of high oxidant days are classified by the month, time of the day, and day of the week. Results of pilot balloon observations are also reviewed. As an example, the vertical distribution of wind velocity measured on August 2, 1974, one of the forecasting days, is given.

57126 **APTIC NO. 81207**

Kato, Tatsuo, and Yoshimichi Hanai

GC AND GC-MS ENVIRONMENTAL ANALYSIS OF PHOTOCHEMICAL SMOG COMPONENT. *(Kokagaku sumogu seibun no GC oyobi GC-MS kankyo bunsekio. Text in Japanese. Preprint, the Japan Society for Analytical Chemistry, Tokyo, p. 197, 1975. (Presented at the Japan Society for Analytical Chemistry, Lecture Meeting, 24th, Sapporo, Japan, Oct. 1-5, 1975.)*

The results of a five-year field investigation of photochemical smog using gas chromatography and gas chromatography-mass spectrometry are reported. The standard procedure for preparation of the test material was applied using a concentration device for GC analysis. Ocrolein, acetone, ester nitrate, and ester nitrite were determined; photochemical products such as nitrophenol and nitrocresol were discovered. The pollutants are related to the use of improved gasolines by automobiles.

57127 **APTIC NO. 76994**

Kesy-Dabrowska, Irena

STATISTICAL DISTRIBUTION OF CONCENTRATIONS OF TOXIC SUBSTANCES IN AIR. *(Statystyczny rozklad stezen substancji toksycznych w powietrzu). Text in Polish. Roczniki Panstwowego Zakladu Higi., 26(2):279-283, 1975. 1 ref.*

The concentration distribution of carbon disulfide, toluene, mercury, acrylonitrile, turpentine, and gasoline in the atmosphere of various industrial plants was analyzed. A total of 2282 concentration levels were measured at 41 working stations. A log-normal concentration distribution was observed, indicating the possibility of predicting the time that a worker is exposed to a given concentration. The highest concentrations were more than four times the mean values and persisted for about 30 min during 8 hr of exposure. The establishment of two maximum permissible concentration values, one for brief periods and one for 8 hr, is recommended.

57128 **APTIC NO. 81374**

Maziarka, Stefan, Maria Borkowska, Zbigniew Misiakiewicz, Artur Strusinski, and Halina Wyszynska

AIR POLLUTION IN THE VICINITY OF METALLURGIC PLANTS. *(Zanieczyszczenie powietrza w otoczeniu zakladu metalurgicznego). Text in Polish. Roczniki Panstwowego Zakladu Higi., 26(5):609-615, 1975. 17 refs.*

Atmospheric air pollution was determined in the vicinity of a metallurgic plant. Although the air pollutant was within the range of permissible values, a survey of the residents showed that the air pollution annoyed them. If the emission of pollution remains at the present level, an isolation zone should be maintained around the plant about 1 km in width.

57129 **APTIC NO. 81233**

Mizokoshi, T., K. Miura, F. Kakibaya, and N. Mizoguchi

PHOTOCHEMICAL AIR POLLUTION IN OITA REGION (I). OXIDANT CONCENTRATIONS IN LOW POLLUTION AREAS. *(Oita chiku ni okeru kokagaku taiki osen (I). Seijo chiiki ni okeru okishidanto nodo). Text in Japanese. Oita-ken Kogai Eisei Senta Nenpo (Ann. Rept. Environ. Pollut. Public Health, Oita Prefect.), no. 2:82-94, Aug. 1975. 6 refs.*

Atmospheric oxidant concentrations were measured during December 1973, and April and August 1974, in the Kuju Plateau, Oita Prefecture, where primary pollutant concentrations are low. In December and April, with steady westerly winds, oxidant concentrations ranged from 40-60 ppb, with no definite daily variations. In December, maximum nitrogen dioxide concentrations were lower than 10 ppb. Maximum sulfur dioxide concentrations were about 10 ppb, except for one day (49 ppb), when there was high activity of the sulfur vents in the Kuju Mountains. During this increase in SO2, ozone concentrations decreased. In April, this inverse relationship between SO2 and oxidant concentrations appeared on 3 days during the week that the measurements were taken. In August, because night winds were westerly, while day winds are from the east and north, oxidant concentrations behaved in a cyclical fashion. Oxidant concentrations peaked (80-100 ppb) around 4-6 pm, because of pollutant diffusion from sources toward Beppu Bay. Average daily oxidant concentrations ranged from 30-40 ppb. The summer oxidant concentrations in rural New York state areas are about 60 ppb. Similar data for Japan have been compiled. A background level of ozone concentration (50-60 ppb) seems to exist, which varies very little with time.

57130 **APTIC NO. 81164**

Ohira, S.

PHOTOCHEMICAL SMOG. *(Kokagaku sumogu ni tsuite). Text in Japanese. Ibaraki-ken Kogaigijyutsu Senta Nenpo (Annu. Rept. Environ. Pollut. Res. Center Ibaraki Pref.), no. 7:53-62, Oct. 1975.*

The Ibaraki Prefectural Government conducted a field investigation of photochemical smog at 16 locations in 1974. Oxidants were measured. The highest measured oxidant content was 0.041 ppm and the lowest was 0.020 ppm. Smog warnings were forecast mostly in August. The 17 reported victims of the smog were mostly minors, and the total number of victims has declined (compared to 207 victims in 1973). Tabulation of oxidant measurements during 1974 is presented. The frequency of smog warning forecasts is given, with a map which shows smog measuring stations. Yearly average oxidant volumes are compared. The amount of time that concentrations exceeded the standard of 0.06 ppm/hr is shown. Oxidant concentrations are related to wind direction for concentrations greater than 0.1 ppm. Yearly trends in the number of smog alerts are described.

57131 **APTIC NO. 81494**

Sakai, H.

ON AIR POLLUTION IN ONAHAMA REGION, FUKUSHIMA PREFECTURE. *(Fukushima-ken Onahama chiku no taiki osen ni tsuite). Text in Japanese. Tohoku Gijutsu-dayori (Tohoku Technol. Bull.), no. 76:1-24, Sept. 1975.*

Data on atmospheric sulfur dioxide and airborne dust for 1968, monitored at 5 locations in the Onahama region, are tabulated. For data covering 102 days, SO2 concentrations, averaged for the 5 locations, reached a daily maximum (over 3.6 pphm) around 10-11 am and a minimum (1.9 pphm) around 11-12 pm. In the Sumiyoshi region, where black ears of rice occur, SO2 concentrations were always over 2.6 pphm. For data covering 157 days, averaged airborne dust concentrations reached daily peaks about 6-7 pm (8.0% change) and 7-8 am (6.2% change), and lows about 12 pm-1 pm (2.7% change) and 3-4 am (2.9% change). The source of SO2 centered in the region around the Onahama Refinery, to the south of the monitoring stations, while airborne dust originated around Shin Nippon Chemical Industries, somewhat to the southwest. There were also industrial dust sources to the north. At two monitoring stations, 0.8-1 km from the main SO2 source (170 m stack), the highest SO2 concentrations occurred at wind velocities of 8-9 m/sec. Smaller peaks appeared at wind velocities near 3 m/sec. For monitoring stations further away, maximum SO2 concentrations occurred at wind velocities near 3 m/sec, while smaller peaks occurred around 9 m/sec. For airborne dust concentrations, maximum peaks occurred at wind velocities of 0-1 m/sec, and smaller peaks occurred around 8 m/sec. Airborne dust and SO2 concentrations decreased as wind velocities increased beyond 8-9 m/sec. High humidity (over 82%) accompanied high SO2 and airborne dust concentrations. High temperature and stable weather conditions increased SO concentrations. Low temperature and unstable weather conditions increased airborne dust.

57132 **APTIC NO. 81202**

Satsumabayashi, Hikaru, Hideo Uchida, Kazutoshi Sasaki, and Yuuhei Nakazawa

METHANE CONCENTRATION IN THE ATMOSPHERE. *(Taikichu no metan nodo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(3):107-110, 1975. 7 refs.*

Methane concentrations were continuously measured 4.5 m above the ground at the Nagano Research Institute for Health and Pollution, Japan, from July to September 1974 and over a rice paddy (ground level; and at height of 4.6 m) during two 30-hour periods in September. Height of rice in the paddy was 85 cm (water level in the paddy, 5 cm) during the first observation, and 87 cm (no water) during the second. At the Research Institute, average atmospheric methane concentration for the 3-month period was 1.66 ppm. Methane concentrations increased from midnight to dawn, then decreased to a nearly constant level during the day. Daytime methane concentrations ranged from 1.4-1.7 ppm, averaging 1.6 ppm. At night, methane concentrations ranged from 1.4-2.0 ppm, with much scattering. Methane concentrations, taken 15 cm above the water level in the paddy, reached a maximum of 2 ppm. When no water was present, generation of methane from the rice paddy was not discernible. Inverse relationships were derived between daily average methane concentration and range of diurnal change in the methane concentration (logarithmic standard deviation of hourly values), and mean wind speed.

57133 **APTIC NO. 81239**

Tsukamoto, T., A. Sato, S. Furui, and K. Sugimoto

REGIONAL SURVEY RESULTS ON COMBINED ATMOSPHERIC POLLUTANT CONCENTRATIONS BY THE RUBBER CRACKING METHOD (REPORT NO. 2). *(Gomu kurakkingu ho ni yoru chiiki betsu taiki fukugo osen busshitsu nodo chosa kekka (Dai 2-ho)). Text in Japanese. Osaka-fu Yakugaku Zasshi (J. Osaka Pharm. Assoc.), 26(9):55-6., 1975.*

Cracking in ozone-sensitive rubber strips (8 mm by 50.8 mm by 2 mm), exposed to air for 10 days, was measured to determine the distribution of combined atmospheric pollutant concentrations in Osaka prefecture in 1973. Rubber strips were hung at appropriate locations in 150 middle schools in Osaka prefecture, and changed at 10-day intervals, at the same time of day in all locations. The depth of cracks in the center sections of the rubber strips were measured with a microscope, and ranged from below 0.10 mm to over 0.55 mm. The heaviest cracking occurred in July; decreases were seen after the latter half of October. Cracking values were highest in the southern regions of the prefecture. The region around Sakai City was always high in cracking values (pollutant concentrations), and no particular changes from 1972 were discerned.

57134 **APTIC NO. 74881**

Watanabe, T.

AIR POLLUTION IN KUSHIRO CITY. *(Kushiro-shi no taiki osen ni tsuite). Text in Japanese. Hokubu Kanku Kisho Kenkyukaishi (North. Reg. Meteorol. Assoc. J.), 1974:27-28, Jan. 1975.*

Kushiro established its own pollution control regulations in October 1971, and the Kushiro Public Health Center has been monitoring dust, sulfur dioxide and aerosol concentrations since December 1963. There has not been much change in dust levels in residential areas. In the center of the city, however, it has gradually decreased reflecting the change from coal to oil fuel. The high concentration of aerosol coincides with the emergence of smog. The daily emission level for SO2 is less than 0.04 ppm, the hourly figure, less than 0.1 ppm. The daily average emission of aerosols is less than 0.10 mg/cu m, hourly figures less than 0.20 mg/cu m. In 1971, 1972, and 1973, there were 31 days when SO2 exceeded the maximum allowable concentration and 9 days when aerosols exceeded the maximum (for 1973 only). The highest concentrations were observed in the evening and in the morning, decreasing during the day and at midnight. When high pressure, clear weather, little wind, and the inversion layer was close to the ground, the concentration was high.

57135 **APTIC NO. 81350**

Winkler, Peter

THE URBAN INFLUENCE ON THE AIR LAYER NEAR THE GROUND. *(Ueber den Stadteinfluss auf den Ozongehalt der bodennahen Luftschicht). Text in German. Meteorol. Rdsch., 28(5):154-156, 1975. 15 refs.*

Results of ozone concentration measurements in the ground layer of the atmosphere in Hamburg and its rural surroundings in August and September, 1974, are presented. The ozone concentration in Hamburg was not significantly higher than in the rural area. The ozone concentration showed a weekly variation in Hamburg, with high values on workdays and low values during weekends, whereas there was no such variation in the rural surroundings. In view of the absence of photochemical smog formation, the low ozone concentrations on workdays must be due to enhanced destruction of ozone by gas reactions in the polluted urban air.

57136 **APTIC NO. 81338**

Yoshida, Tokuhisa

PRESENT SITUATION OF AIR POLLUTION IN JAPAN: SUMMARY OF MEASUREMENT DATA COLLECTED FROM NATIONWIDE MONITORING STATIONS IN 1973. *(Nippon no taiki osen jokyo. Showa 48 nendo zenkoku taiki osen joji kanshi sokuteikyoku ni okeru sokutei kekka no gaiyo). Text in Japanese. Seikatsu to Kankyo (Life Environ.), 29(3):5-11, March 1975.*

A synopsis of the 1973 edition of Present Situation of Air Pollution in Japan published by the Environment Agency, which contains measurement data of sulfur dioxide, nitric oxide, nitrogen dioxide, oxidant, hydrocarbons, carbon monoxide, suspended particulates, and sedimented dust obtained at nationwide monitoring stations, is given. At 46% of 921 monitoring stations, the SO2 concentration was below the environmental standard, and the yearly average was 0.030 ppm. The sulfur content in crude oil and heavy oil decreased from 2.5% in 1967 to 1.43% in 1973. However, the total quantity of S is about the same due to the increased consumption. Therefore, the reduction in SO2 reflects the effect of flue gas desulfurization. As for NOx nitrogen oxides, the environmental standard of 0.02 ppm (daily average of one hour values) was met at only four monitoring stations out of 329. The NOx concentration is unchanged or slightly increasing since 1970. The environmental standard of CO concentration, 20 ppm (8-hour average of 1-hour value) and 10 ppm (daily average), was met at all 70 monitoring stations. The CO concentration is generally decreasing. The HC data are insufficient to evaluate nationwide trends, and only the yearly variation data of HC for Tokyo and Osaka are given.

57137 **APTIC NO. 74649**

Miyagi Prefectural Government (Japan)

ENVIRONMENTAL WHITE PAPER OF 1974. *(Kogai hakusho, showa 49 nenban). Text in Japanese. 280p., March 1975.*

Environmental pollution in Miyagi Prefecture during 1974 is summarized. There were 32 major monitoring stations for air pollution in the prefecture, and a highly dense monitoring system was located along the Sendai Bay area. Atmospheric pollution by sulfur oxides was small, and none of the 52 stations using the lead dioxide method recorded an SOx level greater than 1.0 mg/day/100 sq cm. Dust fall at 13 stations ranged 2.21 to 8.67 tons/sq km/mo and has been decreasing since 1971. Airborne dust pollution monitored at 18 stations ranged from 0.03 to 0.16 mg/cu m. Nitrogen oxide pollution was continuously monitored at nine stations with a telemetry system. The NOx daily average standard of 0.02 ppm was exceeded on several days.

57138 **APTIC NO. 74692**

SULFUR DIOXIDE MEASUREMENTS AT STIGSNAES. *(SO2-malingerne ved Stigsnaes). Text in Danish. Elektroteknikeren, 71(5):122-140, March 1975. 1 ref.*

Sulfur dioxide measurements around Stigsnaes power plant near a large-capacity petroleum refinery in Denmark were performed. Automatic sampling stations were arranged at distances of up to 20 km from the plant. The SO2 concentrations around the power plant area were rather low, with values below 20 micrograms/cu m. The winter values were usually 6-10 micrograms/cu m higher than those recorded in the summer. The contribution of the power plant to the yearly mean SO2 concentration at the most highly exposed sampling station amounted to 5-6 micrograms/cu m. The power plant was responsible for a few extraordinarily high readings; however, these were neither higher nor more frequent than those caused by other sources. Reduction of SO2 emissions from the power plant by switchover to low-sulfur fuel had little effect on the ambient SO2 concentration.

57139 **APTIC NO. 74694**

Muroran Municipal Office (Japan), Pollution Control Dept.

A NOTEBOOK OF ENVIRONMENTAL POLLUTION. *(Kogai techo). Text in Japanese. 59p., 1975.*

A summary of environmental pollution in Muroran, Japan is presented for public distribution. Basic terminology for air, water, and noise pollution is presented. Results of measurements of atmospheric sulfur dioxide, carbon monoxide, airborne dust, sedimented dust, and smoke soot in the city are also presented. The yearly average SO2 levels from 1969 through 1973 were 0.055, 0.030, 0.022, 0.016, and 0.017 ppm, respectively. The fuel consumption in 1973 was 3,010,000 tons of coal and 707,000 kl of heavy oil. About 99.8% of the coal and 97.6% of the heavy oil consumption in 1973 were used for industrial activities. The characteristic pollution in Muroran City was industrial-type pollution caused by iron and steel manufacturing. The pollution tended to spread over a relatively wide area because of the annual average wind velocity of 5.7 m/sec.

57140 **APTIC NO. 78953**

Saitama Prefecture Public Nuisance Research Center

REPORT ON THE AIR POLLUTION MEASURING RESULTS. *(Taiki osen sokutei kekka hokokusho). Text in Japanese. 383p., March 1975.*

Air pollution measurements were carried out at 26 locations in Saitama prefecture from April 1973 to March 1974. Sulfur dioxide was analyzed by conductivity method, nitrogen oxides by spectrophotometric method with Saltzman reagent, airborne particulates by light scattering method, oxidants by potassium iodide method, carbon monoxide by non-dispersive infrared spectrometry and hydrocarbons by flame ionization detector. High SO2 concentrations were observed in the southern prefecture. The average yearly concentration ranged from 0.005 ppm at Chichibu to 0.033 ppm at Toda. At Toda and Soka, 98 days and 59 days out of 345 days, respectively, showed average daily concentrations higher than 0.04 ppm. The average airborne particulates concentrations ranged from 0.047 mg/cu m at Misato to 0.132 mg/cu m at Urawa and Irima. The average oxidants concentration ranged from 0.035 ppm at Kumatani to 0.044 at Koshitani, and the average NOx concentration ranged from 0.046 ppm at Irima to 0.81 ppm at Toda. The highest average CO concentration was 6.0 ppm in front of Takashimaya department store at Omiya.

57141 **APTIC NO. 81684**

Research Group for Air Pollutant Behavior (Japan)

ON WIDESPREAD AIR POLLUTION IN KANTO AREA IN RAINY SEASON. *(Tsuyuki ni okeru Kanto Chiho no koiki no taiki osen ni tsuite). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 90, 1975. (Presented at the Japan Meteorological Society, Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Oct. 29-31, 1975, Paper 221.)*

Air pollutants were monitored at locations 100 km to the north (Mt. Akagi) and south (Mt. Amagi) of the Keihin Industrial Region, Japan, during 10 days toward the end of June 1975. Observations were made at altitudes of about 800 m. An airplane and helicopter were also used to take air pollutant measurements. Sulfur dioxide measurements were above 2-3 ppb at Mt. Akagi on 6 days; they were above 2-2.3 ppb at M. Amagi on 4 days. Winds were mostly northerly. The amount of sulfate in rainwater was higher (3.6-32.2 mg/l) at Mt. Akagi, than at Mt. Amagi (3.0-12.0 mg/l). The amount of SO4 in cloud water was about the same for the two locations (12.0-48.0 mg/l). Iron, copper, chromium comprised the greatest part of the aerosols. The presence of vanadium, indicative of industrial sources, was not detected.

57142 **APTIC NO. 81729**

Nagasaki Prefectural Government, Environment Div.

INVESTIGATION REPORTS ON AIR POLLUTION IN 1974. *(Showa 49 nendo taiki osen chosa kekka). Text in Japanese. 304p., June 1975.*

The results of 1974 measurements of air pollution throughout Nagasaki Prefecture are given for sulfur oxides, airborne particulates, settling dust, nitrogen oxides, photochemical oxidant, and carbon monoxide. The comparison of these data for different areas with previous years is also given. The amount of fuel oil consumed by area in 1974 is given.

1974

57143 **APTIC NO. 71852**

Gatz, Donald F.

ST. LOUIS AIR POLLUTION: ESTIMATES OF AEROSOL SOURCE COEFFICIENTS AND ELEMENTAL EMISSION RATES. *In: Preprint, American Meteorological Society, Boston, Mass., p. 109-114, 1974. 12 refs. (Presented at the Atmospheric Diffusion and Air Pollution Symposium, Santa Barbara, Calif., Sept. 9-13, 1974.)*

Aerosol source coefficients and elemental emision rates are tabulated for airborne particulate samples collected at seven sites in the St. Louis region during June, July, and August of 1973. Source coefficients are given for automobile exhaust, cement manufacturing, fuel oil combustion, steel manufacturing, and coal and soil dust. Substantial agreement is obtained between the computed source coefficients and data from an emissions inventory taken during 1963 as part of an interstate air pollution study except for the combined coal and soil category. The latter discrepancy is likely to be due to the widespread installation of control devices in the intervening 10 yr and the conversion from coal to cleaner fuels. A 50% decrease in the 1963 figure, as an approximate adjustment to a total ambient aerosol basis, still leaves the 1963 coal value greater than the combined coal and soil figure for 1973. Estimated annual emissions in short tons/yr are tabulated for the following elements found in St. Louis aerosols: aluminum, silicon, potassium, calcium, titanium, manganese, iron, zinc, and lead.

57144 **APTIC NO. 81244**

Honma, K. and T. Takahashi

INVESTIGATION OF AIR POLLUTION PARTICLE SUBSTANCE BY METAL THIN FILM METHOD, PART 2. *(Kinzoku hakumakuho ni yoru taiki osen ryushijo busshitsu no chosa, 2). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Natl. Inst. Ind. Health), vol. 1974:66, 1974.*

The acid particle concentration in airborne particulates was determined by the corrosion strength of iron thin film technique. The iron thin film was prepared on a cover slip by making a vacuum deposition of 99.9% iron. The corrosion strength of the iron film with sulfuric acid mist was 5.1 + or - 0.7 sq mm/microgram, while ammonium hydrogensulfate and other sulfate particles gave 1/5 to 1/7 of the corrosion strength obtained with sulfuric acid mist. The detection limit of this technique was 0.1 microgram sulfuric acid. The atmospheric acid particulates concentration measured in the Kawaski City area was 39 to 70 micrograms/cu m air in June, and 2.0 to 4.9 micrograms/cu m in February, and these values were compared with the 0.8 to 1.4 micrograms/cu m level observed in a non-polluted atmosphere. The measurement was also made along the Tama River. Although larger iron film corrosion was observed for the measurement made in the downstream of the river than in the upper stream, reflecting the greater population of industries in the down stream, the acid particulates composition in the airborne particulates was lower in the downstream than the upper stream. Some 44% of the airborne particulates were acid particulates in the downstream location, while this value was 82% in the upper stream location.

57145 **APTIC NO. 76803**

Itoida, M., B. Minamigawa, and T. Ishii

ANALYTICAL TECHNIQUES FOR NITROGEN OXIDES IN THE EXHAUST GASES OF THE STEEL INDUSTRY. *(Seitetsugyo ni okeru haigasu chu NOx no bunseki gijutsu). Text in Japanese. Inzoku (Metal), 44(11):21-23, Nov. 1974.*

The standard chemical analytical procedure and the continuous analytical procedure are compared. The classifications of the chemical analytical process include: the phenoldisulfonic acid method (PDS method), the rapid phenoldisulfonic acid method (rapid PDS method), the nitrate ion electrode process, the zinc reduction naphthylethylenediamine process (Zn reduction NEDA process), the naphthylethylenediamine process (NEDA process), and the Saltzman process. The types of continuous process are chemiluminescence, infrared absorption, ultraviolet absorption, constant potential coulometry, constant potential electrolysis, oxidation and reduction. The PDS and rapid PDS processes are more accurate than the others.

57146 **APTIC NO. 81586**

Lamontagne, R. A., J. W. Swinnerton, and V. J. Linnenbom

C1-C4 HYDROCARBONS ON THE NORTH AND SOUTH PACIFIC. *Tellus (Uppsala), 26(1 and 2):71-77, 1974. 22 refs. (Presented at the G.A.C.G.P. Symposium on Trace Gases, Mainz, Germany, April 1973.)*

Low molecular weight hydrocarbons in the surface waters and atmosphere of the North and South Pacific were measured. Atmospheric methane concentrations averaged 1.44 + or - 0.04 ppm and decreased to 1.36 + or - 0.04 ppm at the Intertropical Convergence Zone. Surface water methane concentrations averaged 0.000042 ml/l, while hydrocarbons containing two to four carbon atoms averaged 0.000001-0.00005 ml/l. A large broad peak for unsaturated hydrocarbons was observed between 10 deg North and 10 deg South. Large concentrations of hydrocarbons containing one to four carbon atoms were found in different types of Antarctic sea ice. Ambient air studies of the ratio of methane/carbon monoxide as an indicator of CO formation from CH4 oxidation suggested that this proposed mechanism may not exist in the southern hemisphere. (Author abstract modified)

57147 **APTIC NO. 81307**

London, Julius and Jean Kelley

GLOBAL TRENDS IN TOTAL ATMOSPHERIC OZONE. *Science, vol. 184:987-989, May 31, 1974. 11 refs.*

An analysis of the mean monthly global distribution of total stratospheric ozone for the 13-year period from 1957 through 1970 reveals an upward trend of about 7.5% per decade in the Northern Hemisphere and about 2.5% per decade in the Southern Hemisphere. The increase seems to have started about March 1961 in the Northern Hemisphere and about September 1961 in the Southern Hemisphere. The cause of these trends is unknown at present. (Author abstract)

57148 **APTIC NO. 71903**

Rossano, A. T. and H. McClannan

CONCENTRATIONS OF ARSENIC AND LEAD IN AIRBORNE PARTICULATES AND HOUSEHOLD DUST IN THE VICINITY OF A COPPER - A PRELIMINARY REPORT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., Pacific Northwest International Section, 10p., 1974. 8 refs. (Presented at the Air Pollution Control Association, Pacific Northwest International Section, Annual Meeting, Boise, Idaho, Nov. 18, 1974, Paper 74-AP-31.)*

Lead and arsenic levels in suspended airborne particulates and household dust near the vicinity of a copper smelter are reported as part of a sampling program studying the extent of contamination for eight trace metals. Daily airborne particulate samples were collected at 10 locations over a 14-day period when the smelter was on strike and during a four-day period during operation. Vacuum cleaner samples were collected from 15 residences and buildings and analyzed for metal content. Average suspended arsenic concentrations ranged from 0.188 during the strike period to 2.32 micrograms/cu m during smelter operation. Airborne lead levels increased from 0.386 during the strike period to 1.417 micrograms/cu m during smelter operation. There was a trend of decreasing metal concentration with increasing distance from ppm (by weight) for arsenic and 320-2600 ppm for lead. These levels failed to show any consistent variations with airborne concentrations or distance from the smelter. The large variations were attributable to environmental and human factors not studied. Arsenic levels frequently exceeded the 24-hour standard of 3.0 micrograms/cu m recommended in Russia.

57149 **APTIC NO. 81627**

REPORT OF REGIONAL SURVEY OF AIR POLLUTION IN COASTAL AREA OF KANAGAWA PREFECTURE. *(Koiki chosa no kekka to kosatsu). Text in Japanese. In: Report of Kanagawa Prefectural Coastal Area Air Pollution Survey Assoc., p. 18-63, Dec. 1974.*

During July of 1973, at 36 spots in Yokohama, Kawasaki, and Yokosuka in Kanagawa prefecture, oxidant measurements were made. Oxidant pollution, damage to human health, meteorological features of the days of high concentrations of pollution, geographical distributions of oxidant concentrations, time changes in geographical distributions of high concentration days, relationships between oxidant and other pollutants were examined. There were 16 days during this period when oxidant concentration reached 15 pphm. The maximum concentration was 30 pphm in Kawasaki. Photochemical pollution warnings were issued 11 times, exceeding 1972 by 4 incidents. In Yokohama, 1286 persons complained on the 9th, 24 on the 10th, 11 on the 13th, 1 on the 16th, and 21 on the 18th. In Kawasaki, it was 30 on the 7th, 129 on the 9th, 2 on the 16th, 8 on the 17th, and 131 on the 18th. In Yokosuka, 23 complained on the 9th, mostly of eye irritation and sore throat; most were schoolchildren. During this period, most days were fine; temperatures were high, exceeding 30 C. When there was a typhoon, temperature fell, there were strong south gales, and pollution was low. Photochemical smog warnings are issued either on fine or cloudy days, but ultraviolet energy must reach a certain strength before the warning standard of pollution is reached. For pollutant transport, wind velocity must be more than 1m/sec. Arithmetic and geometric averages and standard deviations of oxidant concentrations for each spot are given for both 0-24 hrs and 8-1800 hrs. It was found that in measuring oxidant concentration, there was interference from nitrogen oxides. The days and areas of high concentration coincided with days of drastic temperature change and areas where stagnation was apt to occur.

1973

57150 **APTIC NO. 74908**

Matsuda, M., Y. Ban, M. Miyamoto, S. Kobayashi, M. Yanami, Y. Fuchi, and T. Masuda

SURVEY RESULTS OF OBNOXIOUS ODOROUS SUBSTANCES IN NAGASAKI PREFECTURE. *(Nagasakiken ni okeru akushu busshitsu chosa seiseki). Text in Japanese. Nagasaki-Ken Eisei Kenkyusho-ho (Rep. Nagasaki Prefect. Inst. Pub. Health), no. 13:21-28, 1973.*

A survey of odorous emissions from food and feed processes, feed lots, and sewage treatment facilities in Nagasaki Prefecture was conducted. Odors were measured within the facilities and at various distances from them. Most of the checks were made during the summer. All of the establishments exceeded the environment standard (at their demarkation line (ammonia 1 ppm, hydrogen sulfide 0.02 ppm, methyl mercaptan 0.002 ppm, methyl sulfide 0.01 ppm, and trimethylamine 0.005 ppm). The diffusion status of the odors was not adequately evaluated.

57151 **APTIC NO. 73740**

Oltmans, Samuel J.

SURFACE OZONE MONITORING. *World Meteorological Organization, Geneva (Switzerland) and World Health Organization, Geneva (Switzerland), World Meteorol. Organ./World Health Organ. Tech. Conf. Observ. Meas. Atmos. Pollut., Helsinki, Finland, 1973, p. 394-403, WMO 368. 3 refs. (July 30-Aug. 4, Paper N75 11517.)*

NTIS: N75-11476-540

Reasons for making surface ozone measurements are discussed along with instrumentation being used in ongoing monitoring programs. The amount of ozone near the ground at locations uncontaminated by air pollution is indicative of tropospheric-stratospheric exchange processes, since the source region for near surface ozone is primarily the stratosphere while the major sink is the surface itself. The development of improvement instrumentation and the establishment of a number of observation stations in clean air locations promise to provide reliable information on the variation of surface ozone with latitude, season, and weather conditions. Long-term variations in surface ozone are more difficult to detect unless the variation is large since the precision of the most advance instruments is about + or - 10%. Surface ozone measurements within the United States Geophysical Monitoring for Climatic Change program are currently being made at Point Barrow, Alaska and at the South Pole using an electrochemical concentration cell meter. A chemiluminescent detection system is also scheduled for use in the background monitoring program. (Author conclusions modified)

57152 **APTIC NO. 81276**

Popovics, Maria

UP-TO-DATE INTERPRETATION OF URBAN AIR QUALITY DATA. *(Varosi levegominoseg-adatok korszeru ertelmezese). Text in Hungarian. Idojaras (Budapest), vol. 6:338-348, Nov.-Dec. 1973. 4 refs.*

Nation-wide systematic measurements of sulfur dioxide concentrations in 49 towns in Hungary are described. Larsen s mathematical model was used for the interpretation of SO2 data measured in Budapest from March 1, 1968 to Feb. 28, 1969. The SO2 concentration had double maxima. The peak value occurred between 0600 and 1030 am, the second maxima between 0530 and 1000 pm local time. Air quality standards in Hungary for 30 min and for 24 hr are given. For SO2 concentrations in protected areas they are 0.50 mg/cu m for 30 min and 0.15 mg/cu m for 24 hr, respectively. The 30-minute standard was exceeded 3500 times and the 24-hr standard 292 times. The yearly average concentration of SO2 was 0.22 mg/cu m.

57153 **APTIC NO. 72106**

Amagasaki Municipal Office, Bureau of Life and Environment (Japan)

SURVEY REPORT ON THE AIR POLLUTION, NO. 13. *(Taiki osen chosa hokokusho, dai 13-ho). Text in Japanese. 200p., Aug. 1973.*

Measurement results of air pollutants obtained at 5 major monitoring stations (sulfur oxides at 32 locations) in Amagasaki from April 1973 to March 1974 are given. The monthly average concentration of SOx measured by lead dioxide method at 32 locations ranged from 1.18 sulfur trioxide mg/100 sq cm/day in May to 0.49 SO3 mg/100 sq cm/day in October. At the Northern monitoring station, the monthly average concentrations of airborne particulates, nitrogen dioxide, nitric oxide, and oxidants were 0.05 mg/cu m, 0.046 ppm, 0.034 ppm, and 0.025 ppm, respectively. At the Southern monitoring station, the monthly average concentrations of airborne particulates, NO2, NO, and carbon monoxide were 0.10 mg/cu m, 0.045 ppm, 0.048 ppm, and 1.7 ppm, respectively. At the Eastern monitoring station, the average concentrations of airborne particulates, NO2, NO, and CO were 0.11 mg/cu m, 0.038 ppm, 0.032 ppm, and 2.2 ppm, respectively. At the Western monitoring station, the average concentrations of airborne particulates, NO2, NO and CO were 0.03 mg/cu m, 0.052 ppm, 0.033 ppm and 1.9 ppm, respectively. The average wind velocity ranged from 3.3 m/s at the Eastern monitoring station to 1.6 m/s at the Northern monitoring station.

1972

57154 **APTIC NO. 81395**

Nakamura, Kiyoshi, Ketsu Shimoyama, and Noriki Ryo

EXAMPLES OF ENVIRONMENTAL POLLUTION IN A CERTAIN PLACE. *(Aru chiiki ni okeru kogai no jirei kenkyu). Text in Japanese. In: Report on Public Health, Yokohama University School of Medicine, p. 45-49, 1972.*

At present, the Socialist Municipal Government of Yokohama is making a serious effect to fight environmental pollution, and has established strict environmental regulations. However, environmental pollution such as noise, vibration, waste water, soot and dust, smoke, gas, and malodor is emerging in Yokohama. The average monthly sulfur dioxide concentration of Yokohama was 0.022 ppm during the summer months and 0.026 ppm during the winter months in 1970, and the littoral area was reported to have been especially contaminated during summer and winter. The average airborne dust concentration (reflection ratio) was 5.3% during summer and 28.5% during winter in 1970. The dust pollution seems to be affected by local meteorological factors and the living environment. The relation between meteorological conditions and air polluting substances, and the sources of the air pollution are discussed.

ATMOSPHERIC INTERACTION

1976

57155 **APTIC NO. 81440**

Baum, Howard R. and Apostolos E. Germeles

ATMOSPHERIC PENETRATION OF EXHAUST PLUMES UNDER RAREFIED FLOW CONDITIONS. *Quar. Appl. Math., 33(4):395-416, Jan. 1976. 9 refs.*

The atmospheric penetration of exhaust plumes generated by the steady firing of a rocket motor moving at hypersonic speed under rarefied flow conditions was theoretically examined using the kinetic energy theory of gases. The Krook collision model was employed in conjunction with a simple representation of the exhaust gas distribution to derive analytical and numerical solutions for the atmospheric gas density as it penetrated the rocket plume. The atmospheric gas was composed of an initially unscattered beam which was attenuated as it collided with the much denser exhaust plume and a scattered component which was convected away from the motor by the expanding jet. These processes were illustrated for both an axially symmetric and a three-dimensional flow. (Author abstract modified)

57156 **APTIC NO. 81368**

Chameides, William L. and James C. G. Walker

A TIME-DEPENDENT PHOTOCHEMICAL MODEL FOR OZONE NEAR THE GROUND. *J. Geophys. Res., 81(3):413-420, Jan. 20, 1976. 45 refs. (Also includes Chatfield, Robert and Halstead Harrison OZONE IN THE REMOTE TROPOSPHERE: MIXING VERSUS CHEMISTRY. J. Geophys. Res., 81(3):421-423, Jan. 20, 1976. 10 refs., and Chameides, William L. and James C. G. Walker REPLY. J. Geophys. Res., 81(3):424, Jan. 20, 1976. 5 refs.)*

A time-dependent photochemical model for surface ozone is presented. Ozone is treated as an active chemical constituent whose local abundance is controlled by photochemical processes rather than by transport processes. The model reproduces with reasonable accuracy the diurnal variations of ozone and nitrogen dioxide near the ground at Research Triangle Park, North Carolina. The local abundance of oxides of nitrogen plays a major role in determining the intensity of photochemical production and destruction of ozone, a large local abundance of nitric oxide and nitrogen dioxide leading to large diurnal ozone variations. (Author abstract modified)

57157 **APTIC NO. 81430**

Chameides, William L. and Donald H. Stedman

OZONE FORMATION FROM NOX IN CLEAN AIR. *Environ. Sci. Technol., 10(2):150-153, Feb. 1976. 18 refs.*

A theoretical model which explains recent observations of ozone in excess of 80 ppb over relatively rural areas is presented. The proposed mechanism involves the interaction of anthropogenic nitrogen oxides from urban areas with the natural photochemical methane oxidation chain. This mechanism is capable of causing the production of large quantities of ozone in the urban pollution plume, leading to high ozone levels in rural areas downwind of the urban pollution source. (Author abstract modified)

57158 **APTIC NO. 81455**

Johnston, Harold S., David Kattenhorn, and Gary Whitten

USE OF EXCESS CARBON 14 DATA TO CALIBRATE MODELS OF STRATOSPHERIC OZONE DEPLETION BY SUPERSONIC TRANSPORTS. *J. Geophys. Res., 81(3):368-380, Jan. 20, 1976. 25 refs.*

The use of excess carbon-14 data to calibrate models of stratospheric ozone depletion resulting from the emission of nitrogen oxides from supersonic aircraft is described. One-dimensional vertical eddy diffusion coefficient functions are calibrated against quantitative data for the dissipation of excess carbon-14 from the stratosphere during the period 1963-1970. Carbon-14 data appear to give a better estimate of air motion in the stratosphere than strontium-90 data. Models that give a fairly realistic prediction of carbon-14 distribution and persistence are those with minimum vertical eddy diffusion coefficients between 15 and 20 km and with increasing vertical eddy diffusion coefficients from 20-50 km. Ozone projections out to the year 2025 reveal very large reductions in global ozone, amounting to more than a factor of 2. (Author abstract modified)

57159 **APTIC NO. 81453**

Martin, Brian

ON CALCULATING RESIDENCE AND TRANSFER TIMES. *J. Geophys. Res., 81(3):387-394, Jan. 20, 1976. 7 refs.*

A method for calculating the residence times of particles is extended to the calculation of transfer times, i.e., the average time it takes a particle at a given place to move to another place. Calculations to determine where, on the average, particles spend their time before exiting from a system are presented along with methods for calculating residence times when the transport parameters vary with time. An exact solution for residence times is obtained for a one-dimensional problem and is used to gain insight into the method for calculating residence and transfer times. The technique for calculating transfer times is applied to the determination of times for the transfer of particles from the northern to the southern stratosphere.

57160 **APTIC NO. 81631**

Schwiesow, R. L. and R. E. Cupp

REMOTE DOPPLER VELOCITY MEASUREMENTS OF ATMOSPHERIC DUST DEVIL VORTICES. *Appl. Opt., 15(1):1-2, Jan. 1976. 10 refs.*

Remote measurement of the velocity structure in a small-scale, natural atmospheric vortex is reported. The practical demonstration of the applicability of the optical Doppler technique to field measurements on natural vortices is stressed. The cw ir (10.6 micron) Doppler system measures the line of sight velocity components of atmospheric aerosols within the diffraction limited focal volume of the optical system. The velocity spectra obtained are actually line integrals over the range resolution element, weighted by the aerosol backscatter coefficient at 10.6 micron. One generally expects the most significant Doppler return from aerosols in the 1 to 10 micron diameter range, whereas visual aspects are more strongly affected by smaller aerosols. Data were collected on over 40 dust devils during July 1975 in Arizona and Nevada. Data on a small representative vortex are presented. Components up to 10 m/sec were observed near Phoenix and up to 22 m/sec in Nevada. Such values are larger than those observed with cup anemometers at other locations but are not surprising in light of the very high spatial and temporal resolution of the ir Doppler system. Subvortex tangential velocities were generally about 25% of the parent vortex rotational velocity. Data taken through the axis of the vortex, where only turbulent velocity components along the line of sight were expected, revealed a definite periodicity in both peak wind and the velocity at the spectral intensity peak. This suggests either the effect of large, slow subvortices or the existence of waves on the circumference of the main vortex itself. A rather sharp tangential velocity peak at the edge of the vortex gave way to a broader spectrum as various velocity components contributed within the sensing volume. As the measurement angle moved toward the vortex axis, the turbulent spectrum filled in toward zero velocity. The remote Doppler velocity measurement system has proven utility for practical optical applications.

57161 **APTIC NO. 81427**

Thomas, L.

NO CATION AND WATER CLUSTER IONS IN THE D-REGION. *J. Atmospheric Terrest. Phys., 38(1):61-67, Jan. 1976. 37 refs.*

A positive-ion model for the daytime D-region of the upper atmosphere is used to examine the formation of water cluster ions when nitric oxide cation is the major ion produced by photoionization. Particle emphasis is placed on the role of complexes consisting of the NO cation and either carbon dioxide or nitrogen in the NO cation hydration processes as well as on the importance of the collisional dissociation of these ions. The adoption of dissociation rate coefficients consistent with laboratory measurements yields results which are inconsistent with observation of electron concentrations in the middle D-region with the observed transition height between water cluster and NO ions. A reduction in the adopted NO concentrations helps reconcile the calculated and observed electron concentrations; however, it does not appear that the discrepancy in transition height is dependent on the assumed concentrations of neutral constituents. Reductions by more than an order of magnitude in the dissociation rate coefficients appear to be required. (Author abstract modified)

57162 **APTIC NO. 81444**

Van Dop, H. and S. Kruizinga

THE DECREASE OF SULPHUR DIOXIDE CONCENTRATIONS NEAR ROTTERDAM AND THEIR RELATION TO SOME METEOROLOGICAL PARAMETERS DURING THIRTEEN CONSECUTIVE WINTERS (1961-1974). *Atmos. Environ., 10(1):1-4, 1976. 7 refs.*

Area average sulfur dioxide concentrations near Rotterdam, Netherlands were related to meteorological parameters for 13 successive winter periods (1961-1973). A dispersion model relating SO2 concentration with source strength and an experimental 24-hour air pollution index correlated well with observed SO2 values, particularly for the period 1962-1967. A correlation coefficient of 0.93 was obtained for this period, assuming the source strength to be approximately constant. The correlation between sulfur dioxide concentration and meteorological factors (experimental air pollution index), however, dropped to 0.48 when the whole period was considered. This drop in agreement probably was the result of the gradual decrease in emissions due to a switch over to natural gas and the use of low sulfur fuel. The correlation rose to 0.65 when corrections were applied for emission trends. The overall correlation between the calculated and observed SO2 data was 0.96. (Author abstract modified)

1975

57163 **APTIC NO. 81387**

Angell, J. K., C. R. Dickson, and W. H. Hoecker, Jr.

RELATIVE DIFFUSION WITHIN THE LOS ANGELES BASIN AS ESTIMATED FROM TETROON TRIADS. *J. Appl. Meteorol., 14(8):1490-1498, Dec. 1975. 9 refs.*

Estimates of relative diffusion obtained from the rate of separation of the tetroons making up a triad were made, based on radar tracking of 35 tetroon triads at a mean height of 350 m above sea level. The median lateral standard deviation of tetroon position varied from 90 m after a travel time of 15 min to 8000 m after 2 hr, and from 140 m at a travel distance of 2 km to 1000 m at 20 km. The relative diffusion was nearly twice as large under neutral as under stable conditions. (Author abstract modified)

57164 **APTIC NO. 81461**

Ba Cuong, Nguyen, B. Bonsang, G. Lambert, and J. L. Pasquier

RESIDENCE TIME OF SULFUR DIOXIDE IN THE MARINE ATMOSPHERE. *Pure Appl. Geophys. (Basel), 113(4):489-500, 1975. 16 refs.*

Measurements of sulfur dioxide and sulfate aerosol concentrations were obtained in a series of observations made along the French Mediterranean coast, inland and at sea. The variations in the concentrations of these substances were compared with variations in the concentrations of Radon 222 and Lead 212. As the continental air masses passed over the coast, moving seaward, the concentration of these substances were determined by continental factors; over the sea these concentrations steadily decreased, principally due to the effects of atmospheric chemical reaction and absorption by the sea surface for SO2, radioactive decay for Pb212 and Rn222, and vertical mixing for all three. Knowing the original concentration of these substances and the physical laws governing these loss processes, conservation equations can be written and solved for the characteristic rate of vertical mixing and oceanic absorption, which in turn may be used to ascertain the mean residence time of SO2 in the maritime atmosphere. The residence time for SO2 in the Mediterranean marine atmosphere was approximately one half day. This figure is an upper limit, valid for the calm weather conditions which prevailed during the observations. (Author abstract modified)

57165 **APTIC NO. 81637**

Barrett, Earl W.

INADVERTENT WEATHER AND CLIMATE MODIFICATION. *CRC Critical Rev. Environ. Control, 6(1):15-90, 1975. 363 refs.*

Several ways in which human activities can affect weather and climate are discussed. Natural climatic fluctuations are also discussed, as is mathematical modeling of climatic change. Carbon dioxide is discussed in relation to the terrestrial heat balance. The gradual increase of carbon dioxide in the atmosphere at a rate of the order of 0.25%/yr has been well established, but no parallel climatic trend is detectable in the data. The irreversible removal of oxygen from the atmosphere by combustion is insignificantly small unless the supply of fossil fuels proves vastly larger than presently known reserves. The only climatic concern from nuclear testing is pollution by oxides of nitrogen formed in the fireball. Effects of particulate matter on the global heat balance are discussed. Unless a nearly unlimited energy source becomes available, thermal pollution will not pose a serious threat to the stability of global climate for at least 75 yr. Special problems of pollution of the stratosphere are discussed. The large percentages of human-released heat in metropolitan areas are the basis for concern over the local and regional long term climatic effects of thermal pollution. The local and regional effects of water vapor and aerosols are also discussed. The possible effects of land use changes include change in albedo and change in the amount of wind raised particles.

57166 **APTIC NO. 76988**

Benarie, Michael M.

DRY REMOVAL OF SULFUR DIOXIDE IN URBAN AREAS. *Sci. Total Environ., 4(1):113-115, May 1975. 12 refs.*

A method for estimating the urban deposition velocity of sulfur dioxide from bulk indoor-outdoor concentration differences is presented. The deposition velocity is found to vary between 0.003 and 0.3 cm/sec based on an indoor volume in urban areas of between 0.1 and 12.5 cu m/sq m ground surface. The 0.3 cm/sec figure is most likely representative of urban cores fully covered by high buildings and hard-surface roads, whereas the lower estimate of 0.003 cm/sec pertains to areas where the built-up surface makes up only a few percent of the available total, the rest being grass, trees, and shrubbery.

57167 **APTIC NO. 81297**

Bornstein, Robert D.

THE TWO-DIMENSIONAL URBMET URBAN BOUNDARY LAYER MODEL. *J. Appl. Meteorol., 14(8):1459-1477, Dec. 1975. 47 refs.*

A two-dimensional, non-steady model of the flow over an infinitely wide, warm, rough city is presented. The model consists of two layers, a lower analytical constant flux layer, and an upper finite difference transition layer, in which the vorticity and heat conduction equations are solved. The atmosphere is assumed to be Boussinesq, hydrostatic and slab symmetric, while all motions are assumed to be adiabatic. Finite difference solutions are obtained over a variable, interlaced grid, with the use of a time splitting technique, in conjunction with the donor cell method of differencing the advection terms. Simulations were carried out reproducing the daytime flow of a neutral atmosphere over a rough city, and the nighttime flow of a stable atmosphere over a rough, warm city. Comparisons are presented to show that the model is capable of reproducing many of the observed characteristics of the urban boundary layer. (Author abstract)

57168 **APTIC NO. 81383**

Chameides, William

TROPOSPHERIC ODD NITROGEN AND THE ATMOSPHERIC WATER VAPOR CYCLE. *J. Geophys. Res., 80(36):4989-4996, Dec. 20, 1975. 37 refs.*

A model for tropospheric odd nitrogen is presented. It is argued that the vertical profile of nitric oxide, a highly soluble gas, is similar to the vertical profile of water vapor, so that the volume mixing ratio of gaseous HNO3 to water vapor is constant with altitude. The value of this mixing ratio, deduced from the observed concentration of nitrates in rainwater, is 4 times 10 to the -7th power. Because the photochemical interconversion times of the other odd nitrogen species are relatively short, the densities of nitric oxide, nitrogen dioxide, nitrogen trioxide, nitrous oxide, and nitrous acid are obtained from HNO3 profile, assuming local photochemical equilibrium. Sample calculations show reasonable agreement with observed tropospheric NO and NO2 concentrations, as well as the observed rainout rate of nitrates. (Author abstract modified)

57169 **APTIC NO. 81380**

Chameides, William L. and James C. G. Walker

STRATOSPHERIC OZONE: THE POSSIBLE EFFECTS OF TROPOSPHERIC-STRATOSPHERIC FEEDBACK. *Science, 190(4221):1294-1295, Dec. 26, 1975. 20 refs.*

The possible effects of tropospheric-stratospheric feedback on stratospheric ozone were investigated. A decrease in stratospheric O3 results in increased photolytic destruction of nitrous oxide in the troposphere and thereby reduces production of nitric oxide in the stratosphere. Tropospheric N2O variations act to stabilize stratospheric O3. The effectiveness of this feedback mechanism depends upon the sensitivity of tropospheric N2O to changes in stratospheric O3 as well as the sensitivity of stratospheric O3 to changes in tropospheric N2O. This mechanism results in a recovery in atmospheric O3 of about 6-13% of the initial perturbation. (Author abstract modified)

57170 **APTIC NO. 81379**

Citrynell, Harold

ATMOSPHERIC DIFFUSION EQUATION DERIVATION. *Indian J. Phys., 49(5):338-345, May 1975. 11 refs.*

An equation for the vertical diffusion flux of an atmospheric constituent is derived using basic kinetic energy concepts. The derivation results in the same type of equation as that currently used for atmospheric problems. A coefficient, gamma, should be applied to the temperature gradient term, the effect of which is to reduce the relative importance of the temperature gradient for the vertical diffusion flux. (Author abstract modified)

57171 **APTIC NO. 81610**

Clough, W. S.

THE DEPOSITION OF PARTICLES ON MOSS AND GRASS SURFACES. *Atmos. Environ., 9(12):1113-1119, 1975. 12 refs.*

Measurements of the transport and deposition of particles onto the surface of moss bags and flat surfaces of moss or grass were conducted in a wind tunnel. Larger particles were much more efficiently collected than smaller ones for wind speeds normally encountered. Changes in wind speed or particle size exhibited almost the same proportional effect on the collection characteristics of moss bags and extended flat surfaces of moss or grass. Moss bags proved to be unsatisfactory for the monitoring of airborne particulate content because their collection efficiency was dependent on particle size and wind velocity; however, they did appear useful as monitors of dry particulate input to extended crop and soil surfaces. (Author abstract modified)

57172 **APTIC NO. 81340**

Date, K.

ON THE PHOTOCHEMICAL SMOG IN HITACHI CITY. *(Hitachi-shi no kokagaku gumogu ni tsuite). Text in Japanese. Tokyo Kanku Chiho Kisho Kenkyukaishi (Geophys. Notes Tokyo Dist. Meteorol. Obs.), no. 8:173-174, Sept. 1975.*

Data of oxidant concentration (above 0.08 ppm) obtained in Hitachi city during 1973 were analyzed by the concentration rank, number of days and hours, frequency by hour, and wind direction frequency. Oxidant concentrations above 0.12 ppm occurred mostly from mid-July to the end of August and between the hours of 1300 to 1800 with wind direction SSE-SW. The visibility and humidity at 9:00 am were generally good, and the visibility was reduced during the photochemical smog formation. The combined data of visibility, humidity, pressure deviation, pressure pattern, duration of sunshine, wind direction, wind velocity, and oxidant concentration provide criteria for photochemical smog formation forecasting.

57173 **APTIC NO. 74286**

Duckworth, Spencer and Robert W. McCullen

CAN WE EVER MEET THE OXIDANT STANDARD? *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1975. 14 refs. (Presented at the Air Pollution Control Association Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-29.1.)*

An overview of factors affecting the occurrence of oxidant in California's South Coast Air Basin is presented. About 15% of the non-methane hydrocarbon concentrations (NMHC) are geogenic, i.e., from seepage of underground oil and gas deposits. An analysis of chamber studies showed that even initial concentrations of .08 ppmC NMHC and .05 ppm nitrogen oxides can lead to .10 ppm ozone when irradiation time is 10 hr at full solar intensity. Oxidant levels in non-urban areas of low- emission density in California frequently reach .09 to .10 ppm. Daily oxidant occurrence is affected by overnight hangover of oxidant aloft. In a 4-day period in June 1974, the midnight to 6 am mean oxidant at Mt. Lee (el. 1680 ft asl) increased each day from .04 to .15 ppm. There is little trend analysis support for a future downward projection of oxidant concentration. Episode max-hour concentrations have exceeded .50 ppm at least once per year since 1957. Mean third quarter max-hour oxidant concentrations have shown a flat trend since 1968. Emissions due to growth or some other factor are offsetting the decrease in emissions due to controls. The projected mean max-hour concentration at inland stations for 1985 is from .15 to .19 ppm. The .08 ppm times 1 hr oxidant standard in the inland urban areas of California will probably not be met. The mean amount of possible sunshine in Los Angeles in July was 82%. At Eureka (a North Coast station with low oxidant levels), the July sunshine was only 52% of that possible. The abundance of solar radiation in the South Coast enhances the formation of oxidant and represents a natural element over which no control can be exercised. The impact of the temperature aloft is also considered. For summer months with year-to-year changes of mean max temperature in excess of 4 F, the average impact on oxidant is slightly less than 1 pphm oxidant per deg F.

57174 **APTIC NO. 78943**

Duuren, H. van, G. D. Krijt, and A. J. Elshout

SULFUR HEXAFLUORIDE AS A TRACER FOR THE STUDY OF THE DISPERSION OF AIR POLLUTANTS EMITTED FROM PUNCTIFORM SOURCES. *(Zwavelhexafluoride als tracer voor de verspreiding van luchverontreinigende componenten vanuit puntbronnen). Text in Dutch. Elektrotechniek, 53(3):135-143, March 1975. 20 refs.*

The use of sulfur hexafluoride as a tracer in the study of the dispersion and conversion of air pollutants from point sources was investigated. The accuracy, defined as the variation coefficient v. 100%, of the determination of SF6 concentrations in the atmosphere is 20%. This is better than the accuracy that is obtained when the concentrations are calculated as in the case of dispersion from high sources. The degree of conversion of components such as sulfur dioxide, nitric oxide, and nitrogen dioxide in stack plumes is investigated.

57175 **APTIC NO. 81375**

Eloranta, E. W., J. M. King, and J. A. Weinman

THE DETERMINATION OF WIND SPEEDS IN THE BOUNDARY LAYER BY MONOSTATIC LIDAR. *J. Appl. Meteorol., 14(8):1485-1489, Dec. 1975. 7 refs.*

Vertical profiles of the horizontal radial wind component in the lowest kilometer of the atmosphere was measured remotely with lidar. Activities such as aviation takeoffs and landings, prediction of air pollution dispersal, rocket launchings, and boundary layer research benefit from a real time remote sensing technique for obtaining wind profiles. Wind speed determinations were made by observing the motion of naturally occurring aerosol density inhomogeneities. Lidar wind measurements compare favorably with simultaneous pilot balloon observations of the wind. (Author abstract modified)

57176 **APTIC NO. 81612**

Fisher, B. E. A.

THE LONG RANGE TRANSPORT OF SULPHUR DIOXIDE. *Atmos. Environ., 9(12):1063-1070, 1975. 36 refs.*

The long-range transport and deposition (dry and wet) of sulfur dioxide from sources in the United Kingdom and Sweden are mathematically modeled. The British contribution to the average annual deposition of SO2 on Sweden is about 10% of the total annual deposition and about half of the Swedish contribution. The rest of the deposition over Sweden is due to other sources in Europe and natural deposition. Most of the deposition over the United Kingdom appears to be of British origin. The average annual deposition per unit area of rural England is about three times the average annual deposition over rural Sweden. Sulfur dioxide from elevated sources travels farther than SO2 from low level sources. About 6% of the total annual deposition of SO2 over rural Sweden is attributed to high level sources in the United Kingdom. (Author conclusions modified)

57177 **APTIC NO. 81319**

Friend, James P.

COMMENTS ON CHEMICAL AND METEOROLOGICAL EFFECTS AND THEIR RELATIONSHIP TO THE PROBLEM OF ENVIRONMENTAL CONTROL. *Environ. Health Perspect., vol. 10:247-248, April 1975. (Presented at the Conference on Biometeorological Consequences of Environmental Controls, Research Triangle Park, N. C., May 14-15, 1974.)*

The application of models of atmospheric chemistry and transport phenomena to environmental control is discussed. A specific example involving relationships between oxygen, ozone, nitrous oxide, nitric oxide, nitrogen dioxide, nitric acid, water, hydrocarbons, and free radicals is illustrated in relation to the Federal air quality criterion for ozone (0.08 ppm for 1 hr, 1 day/yr). Data on ozone transport from the stratosphere to the troposphere, ozone generation in the troposphere via photochemical processes, and photochemical smog-induced ozone generation are cited to illustrate that ozone concentrations in excess of 0.08 ppm are possible in areas remote from cities. The application of models and chemical reaction mechanisms to atmospheric reactions of stack gas sulfur dioxide is also discussed. In addition to the production of sulfates via oxidation of sulfur dioxide, potential photochemical reactions resulting in nitric acid and ozone formation are deemed possible.

57178 **APTIC NO. 81611**

Goumans, H. H. J. M. and L. A. Clarenburg

A SIMPLE MODEL TO CALCULATE THE SO2-CONCENTRATIONS IN URBAN REGIONS. *Atmos. Environ., 9(12):1071-1077, 1975. 7 refs.*

An area source diffusion model for calculating sulfur dioxide concentrations in urban areas is described and applied to the areas of Amsterdam and The Hague. The model assumes that the urban area source is composed of a very large number of small point sources which are randomly distributed and more or less of equal strength. Values of dispersion parameters are derived from recent literature, and fuel and population statistics are used to determine the source strength of sulfur dioxide emissions generated by space heating. Seasonal mean concentration and frequency calculations of sulfur dioxide correspond reasonably well with experimental data for the two cities examined.

57179 **APTIC NO. 81160**

Grover, S. N. and K. V. Beard

A NUMERICAL DETERMINATION OF THE EFFICIENCY WITH WHICH ELECTRICALLY CHARGED CLOUD DROPS AND SMALL RAINDROPS COLLIDED WITH ELECTRICALLY CHARGED SPHERICAL PARTICLES OF VARIOUS DENSITIES. *J. Atmospheric Sci., 32(11):2156-2165, Nov. 1975. 19 refs.*

Numerical computations were carried out to determine the efficiency with which electrically charged cloud drops and small raindrops of diameters ranging from 84 to 886 micron collide with electrically charged particles of densities between 1 and 4 g/cu cm and diameters between 0.4 and 20 micron. Numerical flow fields about rigid spheres of Reynolds numbers 1, 10, 20, 100, and 200 were used to integrate the trajectory of the particle relative to the collector drop. Two approximate methods were used to represent the electrostatic force between the drop and the particle, and the resulting collision efficiencies show that the representation of the drop and particle by two point charges is a sufficient approximation of the electrostatic force for the majority of atmospheric charges, as long as the drop diameter is larger than 208 micron. The collision efficiency results for particles smaller than 2 micron in diameter show a significant increase over the collision efficiencies for cases where there is no electric charge, for typical charges on drops and particles observed in the atmosphere, and for attractive electrostatic forces. (Author abstract)

57180 **APTIC NO. 81680**

Hayashi, Masayasu and Tatsuo Hanabusa

ON THE RELATIONSHIP BETWEEN ATMOSPHERIC STABILITY AND WEATHER ELEMENTS. DETERMINATION OF WIND DIRECTION ALTERATION. PART 2. *(Taiki anteido to kisho yoso no kanren ni tsuite. Fuko hendo haba no sokutei. Sono 2). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 95, 1975. (Presented at the Japan Meteorological Societyy, Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Oct. 29-31, 1975, Paper 226.)*

The relationships between average hourly values of wind direction changes in the vertical and horizontal directions and degree of atmospheric stability were studied. Measurements were taken in Aomori Prefecture from June 1974 to February 1975 at a weather observation tower (height 50 m). Relationships between wind direction alteration and Richardson number showed that alteration increased as instability increased. This tendency was more pronounced at wind velocities below 5 m/sec. When relationships between wind velocity and amount of insolation with respect to wind direction alteration were calculated, the isopleths showed that Pasquill s stability groupings were not always applicable.

57181 **APTIC NO. 78100**

Hirt, M. S. and J. W. Smith

DILUTION OF CHEMICAL POLLUTANTS BY ATMOSPHERIC DISPERSION. *Chem. Can., 27(5):11-13, May 1975. 10 refs.*

The most important parameters affecting the movement of a plume are the wind speed, turbulence, the vertical wind and temperature gradients. It is of great importance in designing tall stacks to know the wind speed in the region of stack discharge. Wind speed determines the dilution of the pollutants, the speed of dispersal, and the effective rise of a plume from a stack. The downwind concentration of pollutants will be a maximum at a particular wind speed because low ground level concentrations occur with high plume rises, possible at low wind speeds, and also occur at very high wind speeds when the dilution is great. The wind speed may be assumed to follow a semilogarithmic 1/7 power law with elevation in the absence of other data, at least on flat plains. Fluctuations in wind velocity can occur because of mechanical roughness resulting from buildings, trees, etc. and thermal turbulence results from air convection cells developing at the earth s surface due to solar heating. The latter type of turbulence can often result in very high concentrations of pollutants for relatively short periods of time. Mechanical turbulence can also cause high ground level concentrations under some conditions. The types of plume behavior associated with various stability categories are discussed.

57182 **APTIC NO. 81683**

Ishizaki, Kenji

ON THE VERTICAL MOVEMENTS OF SMOKE DISCHARGED FROM A SMOKESTACK. *(Entotsu kara deta kemuri no joge hoko no undo ni tsuite). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 96, 1975. (Presented at the Japan Meteorological Society, Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Oct. 29-31, 1975, Paper 227.)*

Equations were derived to describe the vertical motion of the centers of smoke puffs at a particular distance from the smoke source. Each puff was considered to be a particle in motion, and Taylor s diffusion equations were considered applicable. On April 2, 1975, observations were made from Ebtsu City on smoke puffs generated from a 100-meter stack 3.3 km away. Smoke puffs were photographed at 5-second intervals during a 20-minute period. The wind was from the northeast, at 14 m/s (at the altitude of the stack). The logarithm of the average altitude was directly proportional to the logarithm of the distance between the smoke source and the observation point.

57183 **APTIC NO. 81656**

Junge, C. E.

TRANSPORT MECHANISMS FOR PESTICIDES IN THE ATMOSPHERE. *Pure Appl. Chem., 42(1-2):95-104, 1975. 16 refs.*

Some pesticides have reached the biosphere ranging from pole to pole. It is fairly certain that large-scale transport of pesticides occurs primarily via the atmosphere. Atmospheric transport is therefore of basic importance for the regional and global distribution of these trace substances. It depends on both the chemical properties of the substances and meteorological processes. Global variability of constituents within the troposphere is strongly correlated to tropospheric residence time. Where this is longer than about half a year, the constituent shows a fairly uniform distribution, and the details of the atmospheric transport are unimportant. The parameters which determine the residence time of pesticides are discussed. The magnitude is uncertain at present, even for DDT. Present knowledge on the chemical characteristics and atmospheric residence times of DDT and PCB is reviewed. If the residence time is similar to that of aerosols, about a week atmospheric transport and removal processes. become very important. Some of them are briefly discussed. (Author abstract modified)

57184 **APTIC NO. 81635**

Kao, S. K., Jan Paegle, and R. D. Youngblood

THE EFFECT OF A SINUSOIDAL WAVE MOTION ON DIFFUSION FROM AN INFINITE LINE SOURCE. *Pure Appl. Geophys. (Basel), 113(4): 501-513, 1975. 14 refs.*

An investigation of the effect of sinusoidal vertical motion on turbulent diffusion was made. The two dimensional numerical model which is used is sufficiently flexible to permit spatial flow variations in the vertical plane, but simple enough to allow unambiguous interpretation of the effect of these on a diffusing plume. The only model parameter varied was flow configuration. The diffusion models analyzed were (i) without vertical motion, (ii) with a simple sinusoidal vertical motion of constant amplitude, (iii) with a sinusoidal vertical motion of damping amplitude. The presence of undulations in vertical velocity significantly enhanced the dispersion of pollution. Comparison of effective diffusivity showed an increase by a factor of 3.9 where no damping of undulations occurred, and by a factor of 2.8 where damping of the undulations occurred below the level of the source. This increase in dispersion can largely be explained by the fact that the undulations have created a dilution in concentration because of the vertical motion and a configuration in which horizontal diffusitivity is allowed to have an effect in pulling pollutant away from the axis of maximum concentration. The damping of undulations below the level of the source served to suppress this configuration which in turn reduces dispersion below the source, an obviously favorable antipollution configuration. (Author abstract modified)

57185 **APTIC NO. 81206**

Kawaguchi, Sado and Norio Hayashi

ATMOSPHERIC TURBIDITY RATE AT SHOWA OBSERVATION BASE. PART 2. *(Showa kichi ni okeru taiki kondakudo. 2 ho). Text in Japanese. Preprint, Meteorologi-*

cal Society of Japan, Tokyo, p. 82, 1975. (Presented at the Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975.)

Data on direct solar radiation measured using a pyrheliometer with shot filter OG1, RG2 and RG8 at Showa Observation Base since 1974 were analyzed. The broad band spectrum was measured with a cut-off wavelength for filters of 530, 630 and 700 nm, and transmission coefficients of 0.911, 0.912 and 0.920. The turbidity at each altitude of the sun was obtained over the entire spectrum range. The energy ratio at each altitude of the sun showed a rapid increase at lower altitudes at wavelengths higher than 630 nm, which was considered to be attributable to the effects of low moisture content in the polar atmosphere, and aerosol size distributions. Calculation results of A and B factors for the atmospheric transmission coefficient are given, with descriptions of the calculation method.

57186 **APTIC NO. 76664**

Kikuchi, S. and S. Takahata

AIR POLLUTION IN MURORAN CITY. *(Muroran-shi no taiki osen ni tsuite). Text in Japanese. Hokubu Kanku Kisho Kenkyukaishi (North. Reg. Meteorol. Assoc. J.), 1974:101-102, Jan. 1975.*

A survey of air pollution was made in Muroran City since 1966, and a council was set up. According to the council s report, air pollution was due to industrial sources, but primarily the steel industry. Pollutants include dusts and stack gases. Because the steel industry, oil refineries and cement plants are along the coastal area, air pollution progresses to the outskirts of the city. In winter, when there is a strong seasonal wind, there is a great deal of pollution. Another survey done in July 1974 indicated that in summer, when there is no strong wind, pollution spreads over wider areas of the outskirts. There is less pollution on rainy days than on clear ones. When visibility was poor (not due to fog) there was considerable aerosol in the atmosphere. During July 1974 neither sulfur dioxide, carbon monoxide, nor aerosol concentrations exceeded environmental standards (neither diurnal nor hourly limits). Fluctuation in their concentrations appeared to be related to meteorological phenomena.

57187 **APTIC NO. 77926**

Klemm, R. F. and E. Barillot

SULFUR RELATED ENVIRONMENTAL STUDIES AT ALBERTA RESEARCH: A STATUS REPORT. *Alberta Environment, Edmonton (Canada), Research Secretariat and Calgary Univ., Calgary (Canada), Environmental Sciences Centre, Alberta Sulphur Gas Res. Workshop II Proc., Kananaskis, Canada, 1975, p. 94-105. (Jan. 16-17.)*

The status of Alberta Research Council projects begun since December 1st, 1973 to monitor sulfur in precipitation is outlined. Samples of fresh snow, accumulated snow, rain, and air were collected and analyzed. Fresh snow is very inefficient in removing sulfur dioxide from the atmosphere. Analyses of settled snow suggest that deposition of sulfate-containing particulate is an important sink for atmospheric SO2. Rain samples from all over Alberta indicate dry-deposition to be at least as important as the precipitation mechanism in the removal of sulfur species from air, thus supporting a similar conclusion under winter conditions. The occurrence of acid precipitation may be more common in winter than summer because of the lower concentration of acid neutralizing cations in winter air. (Author abstract modified)

57188 **APTIC NO. 81155**

Kondrat ev, K. J. and O. B. Vasil ev

THE IMPORTANCE OF AEROSOL FOR THE RADIATION BUDGET AND ITS POSSIBLE INFLUENCE ON THE CLIMATE. *(Die Bedeutung des Aerosols fuer den Strahlungshaushalt und sein moeglicher Einfluss auf das Klima). Text in German. Z. Meteorol., 25(3):129-142, 1975. 21 refs.*

Studies on the influence of atmospheric aerosol on the radiation budget and on climate are reviewed with special regard to measurements performed in connection with the CAENEX program. All findings indicate intense absorption of short-wave radiation by aerosol particles. The temperature increase in the atmosphere due to radiation absorption is partly due to intense absorption on soot particles, compounds of trivalent iron, and organic aerosol particles in the submicron range within the wavelength range of 4500-6800 A. The radiation budget of the atmosphere is influenced most strongly by the solid component of the aerosol particles. The climatic changes observed during the last century can be assumed to have been due not only to spontaneous but also anthropogenic emissions, especially in connection with the rapid development of industry and motorization. The percentage of industrial aerosol is estimated at 6% of the total atmospheric aerosol. Atmospheric aerosol might be thought to lead to a cooling of the atmosphere, but since over half of the earth is covered by clouds, the increased concentration of dry aerosol in the atmosphere may generate a tendency toward temperature increase. Atmospheric aerosol causes a noticeable attenuation of solar radiation, especially after volcanic eruptions.

57189 **APTIC NO. 81316**

Landsberg, H. E.

HOUSING: INTRODUCTORY REMARKS. *Environ. Health Perspect., vol. 10:223-224, April 1975. 4 refs. (Presented at the Conference on Biometeorological Consequences of Environmental Controls, Research Triangle Park, N. C., May 14-15, 1974.)*

Problems associated with the biometeorology of indoor atmospheres are discussed. Energy conservation measures can reduce indoor air quality by reducing rates of air exchange with the outside as a result of weather stripping, storm windows, and tighter insulation. Interior combustion processes may thus raise the mixing ratios of carbon monoxide and carbon dioxide. On the other hand, these same conservation measures may also keep out outdoor air pollutants.

57190 **APTIC NO. 81317**

Lee, Douglas H. K.

BIOLOGICAL CONSEQUENCES OF ENVIRONMENTAL CONTROL THROUGH HOUSING. *Environ. Health Perspect., vol. 10:225-233, April 1975. 9 refs. (Presented at the Conference on Biometeorological Consequences of Environmental Controls, Research Triangle Park, N. C., May 14-15, 1974.)*

The social and environmental impacts of current housing design and development are reviewed. Urban heat islands resulting from the agglomeration of buildings in central portions of cities are associated with increased deaths from heat during the summer. Factors contributing to the heat island effect include a reduction in the average windspeed which decreases the dissipation of solar heating, the radiation of heat from one building surface to another during the evening, and heat produced by air conditioner exhaust.

57191 **APTIC NO. 78390**

Lindberg, J. D.

THE COMPOSITION AND OPTICAL ABSORPTION COEFFICIENT OF ATMOSPHERIC PARTICULATE MATTER. *Opt. Quantum Electron., 7(3):131-139, May 1975. 18 refs.*

The optical absorption spectra of atmospheric dust as determined by transmission and diffuse reflectance spectroscopic methods is discussed in the 0.4 to 40 micron wavelength range. The imaginary refractive index is 0.0071, with little wavelength dependence, in the 0.4 to 1.3 micron spectral interval. The absorption coefficients of individual materials found in atmospheric dust are given. Atmospheric dust is composed mainly of weakly absorbing particles contaminated with small amounts of very strongly absorbing materials such as free carbon. The implications of this are discussed from the point of view of laser beam attenuation and lidar return signals. Mie theory computations for ruby lidar wavelenths are shown which suggest that for some models of atmospheric dust, the concept of an average imaginary refractive index may be misleading. (Author abstract modified)

57192 **APTIC NO. 77531**

Mita, Shokichi and Kenji Isono

THE EFFECTS OF AEROSOLS ON THE THERMAL BALANCE OF THE EARTH. ESPECIALLY ON THE EFFECTS OF THE COMPOSITION OF AEROSOLS AND THE CHANGE IN HUMIDITY. *(Aerosol no chikyu no netsu-shushi ni oyobosu eikyo. Tokuni busshitsu sosei oyobi shitsudo henka o koryo shite). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 138, 1975. (Presented at the Japan Meteorological Society Spring Meeting, Tokyo, Japan, May 21-23, 1975.)*

The model consisting of the earth and an aerosol layer over the earth is described. The depth of the aerosol layer is assumed to be 1.5 km. Solar radiation falls on the aerosol layer. Scattering by air molecules is ignored. The aerosol layer is also assumed to be homogeneous. The wavelength of the sunlight is assumed to be 0.694 micron. The surface reflectivity of the earth is assumed to be 0.15. The aerosol is assumed to consist of carbon, sulfuric acid, and silica and to have a Junge particle size distribution. Carbon and sulfuric acid are used to represent the light absorbing materials and hygroscopic substances in the aerosol. The density of the aerosol is assumed to be definite, viz., 500 particles/cu cm, with the radius of the particles being larger than 0.1 micron. The radiation transference equation is solved by an approximation method. Calculations on the reflectivity of the earth are presented for aerosols containing 20% sulfuric acid and various amounts of carbon. When the reflectivity is larger than 0.15, the aerosol is capable of cooling the earth. When it is less, the aerosol warms the earth. An increase in aerosol carbon content results in the heating of the earth.

57193 **APTIC NO. 81685**

Morita, Takahiro and Seiji Ishikawa

RESULTS OF AEROSOL OBSERVATIONS BY AIRPLANE. *(Kokuki ni yoru erozoru no kansoku kekka). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 147, 1975. 3 refs. (Presented at the Japan Meteorological Society, Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Oct. 29-31, 1975, Paper 305.)*

Aerosol observations at an altitude of about 1000 m were made 9 times from March 1973 to March 1975, from the direction of land towards the sea (from Mikawa Bay, Ise Bay, toward Miyake Island and Hachijo Island). The number of condensation nuclei (CN) decreased sharply, but the number of large particles (diameter 20.3 micron) decreased gradually. When CN numbers were less than 1000 cu cm, variations in large particle numbers were small. When CN numbers were large, changes in CN and large particle numbers corresponded well. When lines were drawn to connect locations where the same densities of CN were found, at the altitude of 1000 m, it was clear that patterns of formation of large particles and CN were similar, over the land from Yokkaichi City to Tsu City, and near land over Ise Bay, Mikawa Bay. Where aerosol concentrations were low, or over the ocean, patterns did not coincide, probably due to washout effects on the aerosol particles.

57194 **APTIC NO. 81682**

Naito, Keikichi, Yoshio Yokota, Katsumi Takahashi, and Isao Tabata

ATMOSPHERIC DIFFUSION ANALYSIS BY RIDER. *(Raida ni yoru taiki kakusan kaiseki). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 94, 1975. (Presented at the Japan Meteorological Society, Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Oct. 29-31, 1975, Paper 225.)*

Linear smoke plumes were generated from a helicopter, about 600 m above the ground. Smoke plumes were more than several km long, and were generated parallel to the wind direction. Smoke plumes spread over a wide area, but behaved according to Pasquill s equation. Because of topographical irregularities the dependence of diffusion characteristics on such factors as Richardson number and atmospheric conditions could not be quantitatively determined. Diffusion was small at high wind velocities (above 7 m/s), and high vertical wind shear (above 0.014/sec). Larger diffusion occurred at low wind velocities (below 7 m/s) and low vertical wind shear (below 0.014/sec). Averages and 50% ranges of smoke dispersion were calculated.

57195 **APTIC NO. 81713**

Nakanishi, H.

INSPECTION OF AIR POLLUTION FORECAST MANUAL IN OITA CITY. *(Oita-shi ni okeru taiki osen yoho nanyuaru no kensho ni tsuite). Text in Japanese. Fukuoka Kanku Kisho Kenkyukaishi (Proc. Fukuoka District Meet. Study Meteorol.), no. 36:143-144, Sept. 1975.*

Based on the data obtained during the period of Jan. 1974 to May 1975, the relationship between high oxidant concentration (above 0.1 ppm) and meteorological factors was analyzed. The pressure pattern was classified into six patterns, and the relationship between high oxidant concentration and pressure pattern was analyzed. The wind velocity at 850 mb indicated that it was less than 15 knots on more than 84% of high oxidant concentration days. The MMD (maximum mixing layer height) was obtained from the maximum temperature in Oita and at 850 mb in Fukuoka, and the relationship between MMD and oxidant concentration was analyzed. On the high oxidant days (above 0.13 ppm), MMD was in the range of 700-900 m. However, on low oxidant concentration days, the MMD was scattered The high oxidant concentration occurred generally on sunny days; however, some high oxidant concentration days were cloudy or rainy. Generally, the surface wind was 5 m/s and an NE-ENE direction. The existing oxidant forecasting manual was evaluated based on the above-mentioned data.

57196 **APTIC NO. 81165**

Nakano, Michio and Hitoshi Kono

PHOTOCHEMICAL AIR POLLUTION ANALYSIS IN OSAKA. *(Osaka ni okeru kokagaku taiki osen kaiseki). Text in Japanese. Preprint, Meteorological Society of Japan, Tokyo, p. 99, 1975. (Presented at the Osaka District Meteorological Study Group, Autum Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975.)*

Meteorological conditions associated with high photochemical oxidant concentrations in Osaka were analyzed. Data for wind direction, wind velocity, temperature, sunlight intensity, and precipitation, measured during the period of May to Oct. 1972 and 1973, were used. The frequency of high oxidants concentrations was higher at low wind velocity, no precipitation, intensity above a certain level, and high temperature. The relationship between sea-land breeze and oxidants concentration, the effects of sea breeze on oxidants concentration, and the relationship of the maximum oxidants concentration in the city to the time of the passing of the sea breeze front and the time of the land breeze were analyzed.

57197 **APTIC NO. 81205**

Ogawa, Toshihiro and Takashi Watanabe

STRATOSPHERIC AEROSOL ROCKET OBSERVATION BY SOLAR OCCULTATION METHOD. *(Taiyo enpeiho ni yoru seisoken erozoru no roketto kansoku). Text in Japanese. Preprint, Meteorological Society of Japan, Tokyo, p. 158, 1975. (Presented at the Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975.)*

Distributions of ozone density in the stratosphere and mesosphere were measured by a solar occultation method using solar ultraviolet rays as the light source. Absorption spectra at 2550 and 2900, where the absorption coefficient of O_3 showed a maximum, and at 4500 A, where it was free from the effect of O_3, were measured on Sept. 1973, Jan. and Aug. 1975 by rocket observation. From the vale of extinction at 4500 A, the vertical distribution of the extinction coefficient was obtained. The extinction coefficient of aerosol was obtained by subtracting the extinction due to the absorption by O_3 and nitrogen dioxide and the scattering of atmospheric molecules from the above-mentioned vertical distribution of the extinction coefficient at 4500 A. The vertical profile of the extinction coefficient of aerosol showed a peak at about 20 km, and was in good agreement with the result obtained by Junge. The higher aerosol density measured in Jan. 1975 was considered to be attributable to the effect of the Fuego volcano eruption in Guatemala in Oct. 1974.

57198 **APTIC NO. 81204**

Okamoto, Shinichi, Kiyoshige Shiozawa, Tadashi Hiroo, Atsushi Otaki, Ken Nakamura, and Jyun Koyama

AIR POLLUTION SIMULATION BY DIFFUSION MODEL. *(Kakusan moderu ni yoru taiki osen shumi reishon). Text in Japanese. Preprint, Meteorological Society of Japan, Tokyo, p. 92, 1975. 1 ref. (Presented at the Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975.)*

Calculation results for carbon monoxide concentrations made by normal plume models (including models for stationary states) were evaluated based on the CO concentration measured from April 1972 to March 1973. The plume equation was used for wind velocities above 1m/s, while the puff equation was used for wind velocities less than 1m/sec by integrating to infinite time. Tokyo and Kawasaki were divided into 1 km mesh and surrounding areas into 2 and 4 km mesh (total 811), and a total of 392 concentration calculations were made at three wind velocities, 16 wind directions, four time periods and two seasons. The error distribution of hourly CO concentration was greater and the correlation coefficient was smaller (0.11-0.27) compared to the case of sulfur dioxide concentration reported previously. The calculated value (0.7-1.7 ppm) was generally lower than the measured CO concentration (1.1-2.4 ppm).

57199 **APTIC NO. 81681**

Ota, Shoji and Takashi Adachi

CATEGORY-CATEGORY FORECASTING METHOD FOR OXIDANT AND SOX. *(OX to SOx no kategori, kategori yosoku shuho). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 91, 1975. 2 refs. (Presented at the Japan Meteorological Society, Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Oct. 29-31, 1975, Paper 222.)*

Mathematical models for forecasting oxidant and sulfur oxides pollution on a particular day are presented. The models for oxidant were based on 2 areas in Osaka and the model for SOX was Kashima, Ibaragi prefecture. Pollutant concentrations and meteorological data for the past year are used to derive prediction equations. On the day of the prediction, on-line operations can be easily performed, by using weighted data for the categories (prediction causes; prediction targets). For May-October 1973, model data for oxidant (Osaka) showed 70, 78% accuracy; for SOx (Kashima), 81% accuracy. For wind predictions, model data for Osaka showed about 60% accuracy; for Kashima, 71% accuracy.

57200 **APTIC NO. 81384**

Prinn, R. G., F. N. Alyea, and D. M. Cunnold

STRATOSPHERIC DISTRIBUTIONS OF ODD NITROGEN AND ODD HYDROGEN IN A TWO-DIMENSIONAL MODEL. *J. Geophys. Res., 80(36):4997-5004, Dec. 20, 1975. 71 refs.*

Seasonally averaged distributions of important odd nitrogen (nitric oxide, nitrogen dioxide, and nitric acid) and off hydrogen (hydrogen, OH, hydroperoxy radical (HO_2), and H_2O_2 compounds) were computed using a two dimensional pole to pole chemical model of the atmosphere extending from 8-38 km in altitude Photodissociation of N_2O leads to production of odd nitrogen in the stratosphere and thee odd nitrogen is ultimately removed by downward transport and by rainout into the troposphere (modeled here by a rainout lifetime of 30 days below 8 km altitude). Results are presented for a quasi-steady-state in which seasonal cycles repeat themselves. There are significant latitudinal as well as vertical variations in the predicted species which emphasize the need for at least two dimensions in accurate stratospheric modeling. Computed concentrations are compared with observations when they exist. (Author abstract modified)

57201 **APTIC NO. 74762**

Reiter, Reinhold, Rudolf Sladkovic, and Karl Poetzl

THE PRINCIPAL CHEMICAL COMPONENTS OF THE AEROSOL IN CENTRAL EUROPE IN CLEAN AIR AND 1800 M ALTITUDE. *(Die wichtigsten chemischen Bestandteile des Aerosols ueber Mitteleuropa unter Reinluftbedingungen in 1800m Seehoehe). Text in German. Meteorol. Rdsch., 28(2):37-55, May 1975. 96 refs.*

Since fall 1969, continuous measurements have been made for the quantitative chemical determination, under favorable geographical conditions at a mountain observatory 1780 m a.s.l., of the primary and secondary components of the aerosol, viz. (fron 1969) sodium ion, potassium ion, calcium ion, calcium oxide, ferric oxide, silicon dioxide, alumina; and (additionally, since the end of 1971) lead ion, chloride ion, sulfate ion, and ammonium ion. Dependence of the aerosol concentration and the matrix of chemical aerosol composition upon atmospheric physical and meteorological parameters is investigated and discussed. Precipitation intensity, relative humidity, air temperature, number and size distribution of condensation nuclei, concentration of radium B, vertical exchange intensity between valley interior and station, type of air mass involved, and season were taken into consideration. Under pure air conditions, traces of SiO_2 and sodium ion (not chloride ion) originate from a large area, probably of hemispheric scale. Lead ion, too, originated from a relatively large area, of at least continental scale.

57202 **APTIC NO. 81708**

Roberts, Paul T. and Sheldon K. Friedlander

CONVERSION OF SO_2 TO SULFUR PARTICULATE IN THE LOS ANGELES ATMOSPHERE. *Environ. Health Perspect., vol. 10:103-108, April 1975 12 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

Gas phase and particulate phase sulfur were measured at various locations in the Los Angeles basin to determine atmospheric conversion rates and mechanisms. From measurements of the particulate to gas phase sulfur ratio near the major stationary sources and far downstream and from estimates of travel times determined by air trajectory analysis, it is possible to estimate gas-to-particle conversion rates for sulfur. Estimates have been made of the pseudo first-order rate term for sulfur dioxide to aerosol sulfur conversion in the Los Angeles atmosphere. This rate appears to depend upon parameters such as ozone, free radicals, olefins, and relative humidity which are involved in the complex photochemistry of the Los Angeles atmosphere. Calculations show that automobiles presently contribute a major part of the total sulfur as measured at a receptor site such as Pasadena, while contributing only a small amount to the particulate sulfur loading. The introduction of oxidation catalyst-equipped vehicles may add significantly to the particulate sulfur at downwind receptor sites; predictions of particulate sulfur concentrations near freeways show substantial increases due to such vehicles. (Author abstract modified)

57203 **APTIC NO. 81314**

Robinson, G. D.

METEOROLOGICAL EFFECTS OF ENVIRONMENTAL CONTROLS. *Environ. Health Perspect., vol. 10:211-214, April 1975. 1 ref. (Presented at the Conference on Biometeorological Consequences of Environmental Controls, Research Triangle Park, N. C., May 14-15, 1974.)*

Problems involved in using the continuity equation for air pollution modeling are discussed along with the effect of particulates on atmospheric opacity. The main difficulty with using the continuity equation for air pollution modeling is the fact that there is no soluble set of equations for any kind of average of the fields of concentration and motion. Any formal statement in terms of averages and fluctuations contains more unknowns than equations, and some closure approximation is required. Models are adequate for providing material for criteria and standards only when the chemistry and ultimate fate of the pollutant is known. A review of the effect of particulates on atmospheric opacity indicates that a modification of the manmade particulate load in the atmosphere is likely to affect the radiative properties of the atmosphere in an indirect way by changing the nature of clouds.

57204 **APTIC NO. 81105**

Roegener, H.

METEOROLOGICAL INFLUENCES OF WET COOLING TOWERS ON THE ENVIRONMENT. *(Meteorologische Einfluesse von Nasskuehltuermen auf die Umwelt). Text in German. VDI (Ver. Deut. Ingr.) Ber., vol. 236:233-239, 1975. 10 refs.*

Models describing the physical state and the dispersion of fumes from wet cooling towers for the assessment of their influence on the local climate are described. The model describing the physical state of the exhaust fumes is based on Poppe s theory of cooling towers. The Gaussian plume model is used for the characterization of the dispersion, assuming a Gaussian normal distribution of the concentrations in the vertical and horizontal plane. The dispersion and thermal lift of the exhaust fumes is dependent on such factors as the enthalpy and temperature of the atmospheric air, vertical temperature and humidity gradients in the dispersion layer, and mean wind velocity within the dispersion layer. The models permit the assessment of the influence of exhaust fumes on climatic factors, such as solar radiation, extremal temperatures, precipitation, and humidity at ground level.

57205 **APTIC NO. 81687**

Sato, Kimiyoshi

VARIATION OF AEROSOL GRAIN SIZE DISTRIBUTION BY WASHOUT. *(Washout ni yoru earozoru ryudo bunpu no henkei). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 143, 1975. (Presented at the Japan Meteorological Society, Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Oct. 29-31, 1975, Paper 301.)*

Theoretical calculations were made on effects of washout on grain size distribution of aerosol particles, emitted from a source 20 m high. Aerosol particles were assumed to be dry particles, which are not affected by atmospheric humidity with respect to density and grain size. There was assumed to be no mutual interaction among the particles. The source of the particles was assumed to be a flat surface. The washout coefficient values of Chamberlain were used.

57206 **APTIC NO. 81364**

Seinfeld, J. H. and T. E. Rambhadran

ATMOSPHERIC AEROSOL GROWTH BY HETEROGENEOUS CONDENSATION. *Atmos. Environ., 9(12):1091-1097, 1975. 10 refs.*

The effect of turbulent gas phase concentration fluctuations on the rate of growth of an aerosol by heterogeneous condensation of a single chemical species is considered. The dynamic equation governing the size distribution function of a chemically homogeneous aerosol in the atmosphere is derived. Because the fluid velocities and the gas phase concentration are random quantities, due to the atmospheric turbulence, the size distribution function is also a random quantity. When the equation governing the mean size distribution function is obtained, that equation contains second order moments which express the effect of the turbulence on the rate of change of the mean distribution function. First, a simulation of heterogeneous condensation growth of an aerosol in a spatially homogeneous system in which local gas phase concentration fluctuations exist is performed. The fluctuations can lead to a broader and less peaked distribution than would be obtained in their absence. An extension of the Prandtl mixing length theory is developed for the term accounting for the turbulent contribution to condensation growth in the equation governing the mean aerosol size distribution function for spatially inhomogeneous systems. A characteristic dimensionless group is developed through dimensional analysis which reflects the importance of the fluctuations to the mean rate of condensation. The estimates indicate that close to a common source of gases and particles, mean and stochastic condensation may be of comparable importance in contributing to the evolution of the size distribution. (Author abstract modified)

57207 **APTIC NO. 81235**

Shimogata, Shigeo

THE DEPOSITION OF PARTICULATE MATTER EMITTED FROM STACKS. *(Chinchaku no aru baai no ryushi no kakusan). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 10(5):72-77, Sept. 1975. 11 refs.*

Ground level concentrations of particulates were calculated from solutions of differential equations for diffusion (Smith, 1962), which included terms for downward flux upon particulate deposition. The results more or less agreed with work by Tadmor (1971). The present calculations showed that at leeward distances beyond several tens of km from the particulate source, effects of deposition occur. At these distances, although the height of the particulate source (stack) may be great, ground level concentrations of particulates are greater than those resulting from low stacks, especially when velocities of atmospheric turbulence are high. Mere increase in stack height may not always be beneficial in the reduction of ground level concentrations.

57208 **APTIC NO. 81234**

Sugawara, Kiyoshi and Koji Kitabayashi

MODEL EXPERIMENTS ON STABLE AIR FLOW OVER COMPLICATED TERRAIN. *(Fukuzatsu chikeijo no antei kiryu no moderu jikken). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 10(5):32-44, Sept. 1975. 6 refs.*

Wind tunnel simulation studies on atmospheric diffusion were conducted, for neutral and stably stratified flow, over mountainous terrain near water (scale 1/5000). Two smoke sources (200 m and 300 m high) were used. Average wind velocities were 1.0-1.15 m/sec for the neutral state, and 0.45-0.53 m/sec for the stable state. In the stable state, pollutant concentration accumulated downwind, within 2.5 km of the smoke source. Diffusion in the neutral state occurred more rapidly in downwind and downward directions than in the stable state. In both stable and adiabatic airflow, local high concentrations due to terrain were observed. In stably stratified airflow, vertical diffusion was remarkably regulated by temperature inversion. The lateral displacement of plume axis by terrain effect was exaggerated by thermal stratification. The lateral plume width was wider in stably stratified flow. The Froude number for the neutral state was considered to be about 0.7-0.8; for the stable state, about 1.5-1.8. The bulk Richardson number was about 0.2-0.4.

57209 **APTIC NO. 81571**

Suzuki, Masakatsu, Hiroshi Shikata, and Katsumi Kayoigi

OBSERVATION AND OPTIMUM FORMULAS FOR PLUME RISE AT THERMAL POWER PLANTS. *(Karyoku hatsudensho kara no haien jyosho takasa--Haien hyosho takasa no jissoku to saiteki yosokushiki). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Daiichi Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. (No. 1) Electric Power Ind., Rept.), no. 74124:1-54, June 1975. 32 refs.*

The definition of plume rise, measurement method, meteorological factors affecting plume rise, and measurement method for meteorological factors are discussed. Estimation calculations were made for identical conditions using four formulas by (1) the Tennessee Valley Authority, (2) Central Electricity Research Laboratory, England, (3) Central Research Institute of Electric Power Industry (CRIEPI), Japan, and (4) G. A. Briggs, U. S. At wind velocities above 4 m/sec and power output in the range of 150-500 MW, calculation results are in fairly good agreement with 20% differences. The result of formula (1) was in good agreement with that of formula (2), while formula (3) was in good agreement with formula (4) with 10% differences. However, these formulas are not adequate at wind velocities less than 3 m/sec. Calculation results using the CONCAWE formula and Moses and Carson formula for small and medium scale stack gas sources were compared with those obtained using the formula by CRIEPI, Japan, and results were in good agreement, indicating the versatility of the formula proposed by CRIEPI, Japan.

57210 **APTIC NO. 81356**

Tonna, G.

MICROPHYSICAL ANALYSIS OF ARTIFICIAL FOG THROUGH LASER SCATTERING. *J. Appl. Meteorol., 14(8):1547-1557, Dec. 1975. 32 refs.*

Three fog cycles were produced in an artificial fog chamber and their microphysical parameters determined as functions of time, by means of a laser method. The results (involving the distribution functions of the droplet radius, water content, optical extinction coefficient, and the related quantities) were in good agreement with the literature, and showed the ability of the method to perform a microphysical analysis of an aerosol as a function of time, with a lower particle radius limit of 0.1-0.2 micron. Applications of this method include: development and testing of nucleation, study of the electric charge of droplets; study of the mechanism by which the fog droplets capture small ions, producing a decrease in the electrical conductivity and a related increase of the electric field; and determination of the effect produced by nucleant substances on the droplet radius spectrum. (Author abstract modified)

57211 **APTIC NO. 81616**

Turco, R. P. and R. C. Whitten

CHLOROFLUOROMETHANES IN THE STRATOSPHERE AND SOME POSSIBLE CONSEQUENCES FOR OZONE. *Atmos. Environ., 9(12):1045-1061, 1975. 153 refs.*

The effect of chlorofluoromethane pollution on stratospheric ozone is reviewed. Inert chlorofluoromethanes which are used as refrigerants and aerosol propellants eventually escape and diffuse upward into the stratosphere. Ultraviolet sunlight serves to photodissociate these chlorofluorocarbons into chlorine atoms which catalytically destroy ozone molecules. The present level of chlorofluoromethane production is about 1 megaton/yr. Calculations with a one-dimensional time-dependent atmospheric model suggest that if projected increases in chlorofluoromethane use materialize and there is no tropospheric destruction mechanism for these gases then the total global abundance of ozone may be reduced by more than 20% over the next 50 yr. If the residence times for these fluorocarbons in the troposphere are in the range of 10-30 yr, however, predicted ozone depletions are expected to be significantly smaller. (Author abstract modified)

57212 **APTIC NO. 81339**

Urakawa, T.

ON AIR POLLUTION AT SHUNAN AREA. *(Shunan chiku no taiki osen ni tsuite. Dai-1-po). Text in Japanese. Fukuoka Kanku Kisho Kenkyukaishi Proc. Fukuoka District Meet. Study Meteorol.), no. 36:168-170, Sept. 1975.*

For the preparation of an air pollution forecasting manual for the Shunan area, the relationships between sulfur dioxide and oxidant concentrations and meteorological factors were analyzed statistically, based on data obtained in Shimomatsu city and Fukuoka using sondes. The data were classified by number of days with SO2 concentration above 0.04 ppm and 0.1 ppm and frequency by month and location. Relationships between high SO2 concentration and pressure pattern, atmospheric stability, inversion layer (including type of inversion layer), wind direction and velocity, MMD (maximum mixing layer height), sea-land breeze, and vertical temperature distribution at altitudes below 200 m were analyzed. The number of high oxidant concentration days was 24-25/yr. A case study of April 15, 1975 with high oxidant concentration is given; surface wind velocity at 1m/sec-3 m/sec, clear or slightly cloudy, normal insolation quantity, nocturnal inversion, MMD at 600-650 m and pressure patterns indicated that Shimomatsu was situated behind the migratory high pressure.

57213 **APTIC NO. 81313**

Van der Hoven, Isaac

EFFECTS OF TIME AND HEIGHT ON BEHAVIOR OF EMISSIONS. *Environ. Health Perspect., vol. 10:207-210, April 1975. 2 refs. (Presented at the Conference on Biometeorological Consequences of Environmental Controls, Research Triangle Park, N. C., May 14-15, 1974.)*

The effects of pollutant emission rate and stack height on pollutant emissions are discussed in relation to their interaction with atmospheric conditions. The magnitude of ground-level pollutant concentrations from an elevated release is the result of the interaction of numerous factors, including emission rate and stack height. Added to the latter is the initial plume rise due to buoyancy and inertia forces. Stack characteristics which control plume rise are effluent exit temperature and velocity and stack diameter. Meteorological parameters controlling plume rise are atmospheric temperature and stability and wind speed. Furthermore, the aerodynamic effect of surrounding buildings may cause a phenomenon known as downwash. Highest short-term concentrations of pollutants at the ground occur with looping plumes characteristic of daytime convective thermals and light winds. Highest longer-term (1/2 hr to several hours) concentrations occur with fumigating plumes characteristic of sunrise with light winds, limited mixing height, and near-surface thermal instability.

57214 **APTIC NO. 81688**

Yamamoto, Yoshikazu, Masayuki Tanaka, Sumimasa Kondo, and Yukio Ota

EVALUATION OF AEROSOL ABSORPTION COEFFICIENT BASED ON INSOLATION OBSERVATIONS (II). *(Nissha kansoku ni motozuku earozoru kyushuritsu no hyoka (II)). Text in Japanese. Preprint, Japan Meteorological Society, Tokyo, p. 83, 1975. (Presented at the Japan Meteorological Society, Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Oct. 29-31, 1975, Paper 213.)*

Insolation observations were conducted at Sendai and Tokyo, Japan, and results are analyzed. Aerosol absorption coefficients were determined for the visible spectrum (wavelengths less than 0.7 micron). When observed and calculated values of the absorption coefficients for Sendai and Waikoloa, Hawaii, were compared, values clustered around 0.01.

57215 **APTIC NO. 81572**

Yamashita, Hiroshi

ANALYTICAL MODEL FOR THE AIR POLLUTION. *(Taiki osen kaiseki moderu). Text in Japanese. Opereshion-zu Risachi (Operations Research), 20(9):31-38, Sept. 1975. 6 refs.*

For efficient air pollution control, the constant monitoring of air pollution and enforcement of suitable control measures and development of pollution measurement and forecasting techniques and studies on pollution mechanisms are both essential. Functions required of the computer system for air pollution control are data banks (storage of pollution data, meteorological data), analysis and forecasting (based on the data from the data bank), and administrative functions (enforcement of suitable control measures based on the analysis information). In the air pollution analysis, various simulation models are used. Descriptions of statistical models and physical models which include the Bosanquet-Pearson model, plume model, Puff model, box model, and complex model (plume model + box model and Puff model + multi-layer box model) are given with their characteristics. An example of simulation calculations using the complex model and the data of March 27, 1973 in Chiba is given with results of the concentration distribution and hourly variation. The measured values were in good agreement with simulation values obtained using the complex model.

57216 **APTIC NO. 81621**

Zoran, Maria, P. Pechiu, and C. Simionescu

PECULIARITIES IN THE DIURNAL VARIATION OF ATMOSPHERIC RADIOACTIVITY AND POLLUTANT CONCENTRATION IN PETROSANI. *(Aspecte ale variatiei diurne a radioactivitatii atmosferice si a concentratiei pulberilor poluante la petrosani). Text in Rumanian. Studii Cercet. Fiz., 27(9):875-884, 1975. 13 refs.*

Starting from the diffusion equation for radon 222 and its short- lived radioactive daughters, the relevance of natural radioactivity for pollution measurements is discussed. A short series of radon daughters and pollutant concentration measurements in the vicinity of an industrial area surrounded by mountains is reported. The large scale atmospheric stability during the observationns made possible the detection, mainly through the radioactivity measurements, of such local flow patterns as mountain breezes and a cross sectional circulation due to the differential heating of one side of a valley. The last effect is invoked to explain, besides fumigation, the pronounced morning maximum in the pollutant concentration as due to the passage over the observation point of the pollutants accumulated over the town during the nocturnal inversion. (Author abstract)

57217 **APTIC NO. 81243**

THE STACK IS DRIVEN TO THE HOUSE. *(Der Schornstein faehrt zum Haus). Text in German. Sanit. Heizungstech., 40(11):653-654, 1975.*

Prefabricated heat-insulated steel stacks, manufactured by the Volund Company, Denmark, are described. Such prefabricated stacks are available in sections of up to 40 m, and can be used for a maximum height of 120 m. It takes a few hours to one day to erect and assemble such a stack. These stacks provide for an increased thermal lift and consequently for a better dispersion of the air pollutants due to their lower friction coefficient as compared with conventional stacks.

1974

57218 **APTIC NO. 81034**

Auer, August H., Jr.

THEE PRODUCTION OF CLOUD AND AITKEN NUCLEI BY THE ST. LOUIS METROPOLITAN AREA (PROJECT METROMEX). *J. Rech. Atmospheriques, vol. 1974:12-22, 1974. 5 refs.*

The production of cloud and Aitken nuclei by thee city of St. Louis was established quantitatively by measuring the mean concentration and vertical columns upwind and downwind of the metropolitan area. The mean concentrations of cloud nuclei (active at supersaturations from 0.2% to 3.5%) and Aitken nuclei were measured during Aug. 1971-1973, under the auspices of Project METROMEX. Besides these nuclei concentrations, mean wind speed over the metropolitan area and the area of production also served as input to the budget computation. Within the ranges of activating supersaturations from 0.5% to 3.0%, the downwind concentration of cloud nuclei increased twofold over the corresponding upwind concentrations. On the average, Aitken nucleus concentrations increased downwind of the metropolitan area by slightly more than an order of magnitude above the upwind values.

57219 **APTIC NO. 81058**

Auer, August H., Jr. and Richard A. Dirks

CONTRIBUTIONS TO AN URBAN METEOROLOGICAL STUDY: METROMEX. *Bull. Am. Meteorol. Soc., 55(2):106-110, Feb. 1974. 6 refs.*

A systematic case study approach used to delineate and describe the modification of the atmosphere by urban influences and to determine the effect of these parameters on critical atmospheric processes is described. Field programs were conducted during the months of August 1971-1973 in St. Louis using the Lavoie airflow model. The model assumes a well mixed layer capped by a temperature inversion and stable layer. The airflow within the well mixed layer and the height of the capping inversion were altered in response to forcing from the friction layer produced by variation in terrain height, frictional drag, and low level heating. The integrated effects of the urban dynamics at levels in the atmosphere corresponding to approximate convective cloud base are dynamical influences which could conceivably affect convective precipitation locally. Such influences are revealed by the spatial and temporal variations of elevated discontinuity surfaces.

57220 **APTIC NO. 81042**

Bodhaine, B. A. and R. F. Pueschel

SOURCE OF SEASONAL VARIATIONS IN SOLAR RADIATION AT MAUNA LOA. *J. Atmospheric Sci., 31(3):840-845, April 1974. 41 refs.*

Solar radiation transmission data taken at Mauna Loa exhibit a seasonal variation with the minimum in summer. These variations may be due to the seasonal generation of organic aerosols by the biosphere. The naturally produced atmospheric background aerosol of organic origin may cause the typical seasonal turbidity variations. Furthermore, changes in the amplitude or phase of transmission data could be used to indicate whether aerosols from anthropogenic sources would influence the earth s albedo. Precipitable water calculations suggest that humidity data above Mauna Loa are not accurate enough to make a quantitative estimate of the effect of atmopsheric water vapor on Mauna Loa radiation data. However, water vapor apparently cannot account for these variations on the basis of phase angle considerations. (Author abstract)

57221 **APTIC NO. 72968**

Briggs, Gary A.

PRELIMINARY DRAFT. DIFFUSION ESTIMATION FOR SMALL EMISSIONS. *In: Environmental Research Laboratories 1973 Annual Report. National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., Rept. ATDL-106, p. 83-145, Dec. 1974. 19 refs.*

Procedures for the calculation of ground level concentrations of effluents from small industrial and fuel burning installations (source heights of less than 100 m) are discussed. Topics covered include: the calculation of effective plume height, assuming that it escapes the downwash effect of the stack and buildings; methods for predicting the occurrence of downwash; the estimation of building and buoyancy effects; the use of diffusion model coefficients and stability classes for estimating ground level concentrations from both elevated and ground sources; the computation of long term average concentrations; the extension of classical methods to the prediction of the long-term average deposition of particulates (30 days to 1 yr), the effects of mechanical and convective turbulence on plume diffusion in urban areas; and the effects of topographical interactions in diffusion.

57222 **APTIC NO. 72962**

Carlson, Paul E. and John A. Scuderi

METEOROLOGICAL STUDY FOR TOOELE ARMY DEPOT. VOLUME I OF 2 VOLUMES (FINAL REPORT). *H. E. Cramer Co., Inc., and Dept. of the Army, Utah, Dugway Proving Ground, Army Contract DAADO9-74-C-0006, Proj. 5-CO-523-ECP-004, Rept. DPG-FR-C965A-I, 104p., Aug. 1974.*

NTIS, DDC: AD784572

The meteorological aspects of potential air pollution problems resulting from the disposal of stockpiled chemical agents and munitions at the Tooele Army Depot were studied, with particular attention to the possible release of oxidants, suspended particulates, sulfur dioxide, and nitrogen dioxide from several 15-meter smoke stacks on the base. Continuous 1-hour plant stack emissions were simulated using a fluorescent particle tracer during a wide variety of atmospheric conditions. A reliable safe-sided model to predict ground-level concentrations at the periphery of the depot was developed since the cost of a sampling network designed to detect maximum short-term ground-level concentrations (1-8 hr) was prohibitive. The model, when utilized in conjunction with an eight-station air monitoring network is expected to provide more complete assurance that air quality standards are not being exceeded. Meteorological observations at the depot periphery are going to be used in conjunction with the diffusion model.

57223 **APTIC NO. 69686**

Dabberdt, W. F. and P. A. Davis

DETERMINATION OF ENERGETIC CHARACTERISTICS OF URBAN-RURAL SURFACES IN THE GREATER ST. LOUIS AREA. *Stanford Research Inst., Menlo Park, Calif., Atmospheric Sciences Lab., Environmental Protection Agency Contract 68-02-1015, Proj. 26AAI/16, ERU-2322, Program Element 1AA003, Rept. EPA-650/4-74-007, 115p., April 1974. 9 refs.*

NTIS: PB 237 704/AS

The role of surface geophysical characteristics (e.g., albedo, thermal admittance, Bowen ratio, emissivity) in the partitioning of energy at the complex and heterogeneous earth-air interface in the urban and rural greater St. Louis area was evaluated through a unique application of Lettau s climatonomy theory. Aircraft measurements were made at 2-3 hr intervals from altitudes of 460-1220 m above ground and included downwelling and upwelling solar radiation, surface radiative temperature, and air temperature. Continuous records of downwelling solar and atmospheric irradiances were obtained at a single surface station located adjacent to the flight track. Balloon soundings of the lower atmosphere also were used in the analysis. The feasibility of implementing the climatonomical approach was evaluated on the basis of experimental data obtained on August 9, 1972. Albedos showed a maximum near 16% over the rural sites comprising farms, fields, and woods, with a minimum near 13% over the older urban residential and commercial/industrial sites. Urban surface temperatures were higher than rural surface temperatures, with the maximum difference (10-15 C) occurring in the early afternoon. The estimated thermal admittance ranged from a minimum of 20 mly/sec to one-half power times degrees for urban and suburban sites to about 85 for wooded sections. The estimated inverse Bowen ratio ranged from 0.22 in the urban area to 2.9 for farmland. (Author abstract modified)

57224 **APTIC NO. 74425**

Fukuoka, Yoshitaka

METEOROLOGICAL STUDY OF AIR POLLUTION (2). EFFECT OF WIND DIRECTION AND LAND RELIEF ON THE DISTRIBUTION OF AIR POLLUTION. *Fukushima Daigaku Kyoiku gakuba Rika Hokoku (Sci. Rep. Fac. Educ. Fukushima Univ., no. 24:67-77, Nov. 1974. 6 refs.*

The relation between amount of sulfur discharged from industrial emission sources and the sulfur dioxide concentration measured by the lead peroxide candle method to influence of wind direction and topgraphy ambient concentrations of the pollutants is studied. High concentrations of pollution were divided among three or four regions and corresponded generally to plant density and wind direction. Mountains more than 100 m above sea level acted as walls, preventing the diffusion of smoke and distributing it along the wall. The SOx concentration increased yearly, and the most the peaks of pollution shifted from coastal to inland districts. The highest concentration was recorded winter, the lowest in the fall. The former was due to excessive consumption of fuel containing a high percentage of sulfur. Most of the correlation coefficients between the amount of sulfur given off by a plant and the total SOx concentration were lower than expected. The best regression equation for the determination of pollutant concentration may be obtained from the amount of fuel utilized by groups of plants, taking the wind direction into consideration.

57225 **APTIC NO. 78551**

Herman, Benjamin M.

THE CHANGE IN EARTH-ATMOSPHERE ALBEDO DUE TO STRATOSPHERIC POLLUTION. *Dept. of Transportation, Washington, D. C., Climat. Impact Assess. Conf., 3rd, Cambridge, Mass., 1974, p. 422-427, 5 refs. (Feb. 26-March 1.)*

NTIS, DDC: AD A003846

Theoretical calculations of the change in earth-atmosphere albedo are presented for a wide range of aerosol loadings up to 3.2 micrograms/cu m in a perturbed stratosphere. These calculations are based upon a complete solution to the equation of radiative transfer, which includes all orders of multiple scattering by both the aerosol and the molecular constituents. The aerosols are assumed to be distributed throughout the 15 to 25 km height interval. Calculations are presented for a wavelength of 0.5 micron. A range of solar-elevation angles and ground albedos is employed to cover all possible conditions. Absorption by the aerosol layer is considered by taking a range of single-scattering albedos for the particulates. (Author abstract modified)

57226 **APTIC NO. 78508**

Hoult, David P. and William T. Kranz

FEASIBILITY OF FUEL SWITCHING IN BOSTON (FINAL REPORT). *Massachusetts Inst. of Tech., Cambridge, Energy Lab., Rept. MIT-EL-74-001, 38p., Feb. 1974. 38 refs.*

NTIS: PB-234 535

A simple physical model predicts that the nighttime dispersion of sulfur dioxide from the largest sources in Boston differs from daytime dispersion and is different from the dispersion from small, low level sources. Large sources are clearly defined as those for which the equilibrium position of the bottom of the plume is above the nighttime mixing depth. Pollutants emitted from such sources have almost no effect on the nighttime concentrations. Measurements of diurnal variations in Boston sulfur dioxide levels over a 7-year period are analyzed, and correlations of these data, generated by the theory, allow estimation of the fraction of the time large sources can burn high sulfur fuel at night while meeting EPA standards for sulfur dioxide. The model incorporates past theory and data on plume aerodynamics and complex atmospheric flow, and the report applies this information to a core area of urban Boston. (Author abstract modified)

57227 **APTIC NO. 81372**

Kapustin, V. N., Y. S. Lyubovtseva, and G. V. Rozenberg

VARIABILITY OF AEROSOLS UNDER THE INFLUENCE OF CLOUD MODULATION OF THE RADIATION FIELD. *Bull. Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk. SSSR, Fiz. Atmosfery i Okeana, 10(12):819-821, Dec. 1974. 11 refs.*

The variability of measurements of aerosols under the influence of cloud modulation of the solar radiation field is discussed. The variability implies a perceptible influence of the radiation field on the optical properties of the aerosols, such as substantial nonlinearity of the aerosol effect on radiative heat transfer processes in the atmosphere. The basic floor regulating the variations in the size distribution of the optical active finely dispersed aerosol fraction under natural conditions is the assimilation or disassimilation of moisture by the aerosol. The finely dispersed aerosol fraction is in a state of highly mobile equilibrium that is sensitive to all factors capable of influencing relative air humidity, including variations in the cloud cover. The factor must be taken into account in observational studies of atmospheric aerosol parameters.

57228 **APTIC NO. 81278**

Knapp, Hubert J., Robert D. Gillespie, Allan G. Turton, and James F. MacLaren

TORONTO DISTRICT HEATING STUDY. *International District Heating Assoc., Pittsburgh, Pa., Intern. Dist. Heating Assoc. Annu. Meet. 65th, Cooperstown, N. Y., 1974, p. 37-49. (June 24-26.)*

An air pollution model developed to ascertain the effects of expanding the existing Toronto, Ontario Hydro-Electric System is described. The model consists of three major elements: an emission inventory, a meteorological input, and a simulation model. The model computes hourly pollutant concentrations in the atmosphere over a given area. The model treats four types of air pollution sources: sources beyond the boundary of the model; numerous small sources which are treated at a continuous area source; point sources such as large industrial chimneys and the chimneys of district heating plants; and line sources such as major streets and expressways. Hourly values of meteorological parameters and diffusion data as well as mixing depth are required by the model. Together they form the meteorological input to the simulation model. Wind speed, temperatures, horizontal and vertical diffusion values, and the depth through with the air pollutants are mixed can all be changed from 1 hr to the next. The main output from the model gives pollutant levels at three elevations at the center of each grid square. A companion output provides data for plotting small scale maps. A tape is produced listing pollutant concentrations at 100 grid square locations, 80 of them within the city, and this tape is used by the city computer to generate a large scale map of pollutant concentration levels.

57229 **APTIC NO. 81265**

London, Julius and Jae H. Park

THE INTERACTION OF OZONE PHOTOCHEMISTRY AND DYNAMICS IN THE STRATOSPHERE. A THREE-DIMENSIONAL ATMOSPHERIC MODEL. *Can. J. Chem., 52(8):1599-1609, 1974. 40 refs.*

A three dimensional global circulation model of the photochemistry and transport of stratospheric ozone is described. The photochemical calculations for ozone are carried out as time dependent in a three-dimensional oxygen-hydrogen-nitrogen system. The dynamic model is started from an atmosphere initially at rest and then is spun up to a steady state circulation corresponding to mid-January. An initial observed ozone distribution is added and the model is then run through 30 simulated days. An analysis of the time variation of the ozone distribution reveals that photochemistry dominates the ozone changes in the sub-solar middle stratosphere and that transport processes redistribute the ozone poleward and downward into the troposphere. Although the general pattern of ozone changes seems to be correct, the model produces too much ozone in the southern hemispheric subtropical stratosphere and transports too much ozone into the northern subtropical troposphere. A computed lower boundary flux of about 5 times 10 to 10/sq cm/sec corresponds quite well to estimates in the literature. (Author abstract modified)

57230 **APTIC NO. 81306**

Lyons, Walter A.

INADVERTENT WEATHER MODIFICATION BY CHICAGO-NORTHERN INDIANA POLLUTION SOURCES OBSERVED BY ERTS-1. *Monthly Weather Rev., 102(7):503-508, July 1974. 17 refs.*

An example of inadvertent weather modification over the southern basin of Lake Michigan was observed by an Earth Resources Technology Satellite. Easily visible smoke plumes from a number of major industrial complexes in the Chicago-Gary, Indiana area appeared to markedly affect cumulus patterns. Cloud streets developing over Lake Michigan underwent enhancement when aligned with the industrial plumes. The cumulus elements of the cloud streets became larger and brighter (and presumably thicker) than those forming in unpolluted air. (Author abstract modified)

57231 **APTIC NO. 77907**

Panofsky, H. and W. Heck

VERTICAL DISPERSION NEAR 20 KM. *Dept. of Transportation, Washington, D. C., Climat. Impact Assess. Conf., 3rd, Cambridge, Mass., 1974, p. 102, 1 ref. (Feb. 26-March 1.)*

NTIS, DDC: AD AO 03846

Vertical mixing coefficients are being determined from high altitude clear-air turbulence data. Preliminary estimates of average subsynoptic mixing coefficients at 20 km suggest 100 sq cm/sec or less. These values are significantly lower than the total vertical coefficients inferred from total transports. The large difference between small-scale and large-scale mixing coefficients accounts for the fact that individual layers with peculiar concentrations of ozone and dust can sometimes be identified for a yr. A plume from an individual airplane track will spread very little vertically, but will broaden horizontally, primarily because of wind shear, and take on the general shape of a pancake. (Author abstract modified)

57232 **APTIC NO. 81581**

Park, Jae H. and Julius London

OZONE PHOTOCHEMISTRY AND RADIATIVE HEATING OF THE MIDDLE ATMOSPHERE. *J. Atmospheric Sci., 31(7):1898-1916, Oct. 1974. 112 refs.*

The distribution of minor atmospheric constituents, principally ozone and atomic oxygen, and their contribution to the heat sources and sinks in the earth's middle atmosphere (30-100 km) were investigated. The latitudinal and seasonal distributions of radiative heating rates for the region 30-100 km were computed considering the absorption of solar ultraviolet radiation by molecular oxygen and ozone and the chemical heat release by atomic oxygen recombination. Absorption of solar radiation by ozone was responsible for most of the radiative heating in the 30-75-kilometer region. The heating rate was relatively small between 75 and 90 km, with absorption by molecular oxygen and ozone contributing about equally. The heating rate ude to absorption by molecular oxygen was of major importance above 90 km, although non-equilibrium production of atomic oxygen in the summer resulted in reduced heating rates at these levels. The effective heating rate at 100 km was about 40 K/day at high latitudes during the summer. Recombination of atomic oxygen in the winter polar mesosphere and lower thermosphere resulted in a significant heat source for that region. Meridional gradients of computed heating rates in the upper atmosphere were found to be generally larger than previous results. (Author abstract modified)

57233 **APTIC NO. 81373**

Prishivalko, A. P. and L. G. Astaf yeva

ABSORPTION, SCATTERING AND EXTINCTION OF LIGHT BY WATER-COATED ATMOSPHERIC PARTICLES. *Bull. Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk. SSSR, Fiz. Atmosfery i Okeana), 10(12):815-818, Dec. 1974. 17 refs.*

The absorption, scattering and extinction of light by water-coated insoluble atmopsheric aerosol condensation nuclei was calculated. The computation was made to study the influence of a growing envelope. The problem of finding the effective cross sections of these variables for 2-layered particles was solved using a theory that describes the diffraction of a plane electromagnetic wave on a spherical particle with a concentric core. Although the expressions obtained have the same form as in the Mie theory, the coefficients are determined in a much more complex fashion. This study establishes the manner in which the asymptotic values of the effective absorption cross sections of water coated particles depend on the optical properties and dimensions of the cores.

57234 **APTIC NO. 81584**

Pueschel, Rudolf F., Charles J. Garcia, and Richard T. Hansen

SOLAR RADIATION: EFFECTS OF ATMOSPHERIC WATER VAPOR AND VOLCANIC AEROSOLS. *J. Appl. Meteorol., 13(3):397-401, April 1974. 16 refs.*

The effects of absorption by atmospheric water vapor and absorption plus scattering by aerosol particles expelled from nearby volcanic eruptions on solar radiation values measured at Mauna Loa, Hawaii were evaluated over a 9 1/2-month period from August 15, 1971 to May 31, 1972. Atmospheric water vapor attenuated the normal incidence of solar radiation by up to 10%. Decreases in direct solar radiation of from 5-15% were observed along with associated tenfold increases in the brightness of the aureole (at 0.38 deg from the center of the sun in the red spectral region) immediately after new eruptions of Kilauea and with unusual atmospheric circulation around the island. Elaborate methods appear to be required to correct solar radiation data with respect to water vapor before it is possible to monitor presently existing trends in atmospheric turbidity with wavelength-integrating pyrheliometers. (Author abstract modified)

57235 **APTIC NO. 75166**

Shaw, Glenn E. and Charles S. Deehr

RELATIONSHIP BETWEEN CIRCUMSOLAR SKY BRIGHTNESS AND ATMOSPHERIC AEROSOLS (FINAL REPORT). *Alaska Univ., Fairbanks, Geophysical Inst., Environmental Protection Agency Grant 801113, Program Element 1AA009, ROAP 26AAS, Rept. EPA-650/4-75-012, 115p., June 1974. 29 refs.*

NTIS: PB 241806/AS

Measurements of the sky brightness in the solar vertical plane and in the solar almucantar were taken at an arctic location near Barrow, Alaska, a sub-arctic location at Ester Dome, Alaska, and a tropical station at Loiyengalani, Kenya to obtain the aerosol scattering phase function for various synoptic conditions and air-mass types in locations far removed from urban pollution. A complex relationship existed between the aerosol size distribution function and air mass type. Generally polar air masses exhibited lower columnar concentrations and a relatively larger ratio of small to large particles. Forest fire smoke advected into interior Alaska from Eastern Siberia possessed a size spectrum that was approximated by a Junge power-law distribution with an exponent value numerically equal to 4.0 + or - 0.2. Aerosols generated by local convection possessed a power-law exponent equal to 2.5 + or - 0.3. The measurement of the brightness gradient and absolutely intensity of scattered sky radiation appears to be applicable to studies involving the transport and origin of atmospheric aerosols. (Author conclusions modified)

57236 **APTIC NO. 77454**

Stephenson, R. L.

A PROGRAM FOR COMPUTING THE DISPERSION OF AIRBORNE CONTAMINANTS. *Oak Ridge National Lab., Oak Ridge, Tenn., Computer Sciences Div., National Science Foundation Contract 7405-eng-26, 44p., Sept. 1974. 4 refs.*

NTIS: ORNL-TM-4674

A FORTRAN program for computing the distribution of airborne pollutants has been written in two versions. One is intended for calculations involving large numbers of sources. The other is a tutorial version, which provides the capability to visualize the effect of proposed sources and study the effect of changing the relevant parameters. In both versions, the output displays the calculated concentration of pollutants in the form of a rudimentary map. (Author abstract)

57237 **APTIC NO. 73700**

Taylor, P. A.

URBAN METEOROLOGICAL MODELLING - SOME RELEVANT STUDIES. *Advan. Geophys., vol. 18B:173-185, 1974. 18 refs.*

Urban airflow modelling is discussed in relation to its present state of the art and its future prospects. Such modelling is in many ways a synthesis of a range of modelling problems for the atmospheric boundary layer. Many of the problems are similar to those associated with subgrid-scale processes for large-scale numerical weather prediction, and many of the numerical aspects are related. One of the most pressing problems in urban airflow modelling is the development of efficient finite difference methods for solving the governing equations with dynamic pressure effects included both for steady state and time dependent situations. Models that represent the airflow in and around a particular city are with 3-5 yr of making their appearance. Solutions for flow over topography that make use of Chorin s method of artificial compressibility adapted for block iterative techniques are presented.

57238 **APTIC NO. 72971**

Vickery, B. J. and L. W. Apperley

ON THE PREDICTION AND EVALUATION OF THE GROUND LEVEL WIND ENVIRONMENT. *Preprint, 25p., 1974 (?). 3 refs.*

NTIS: PB 234774

Tentative acceptance criteria for ground level wind speeds are presented along with a descripiton of an experimental approach to the prediction of the ground level wind environment. The predictive approach relies on the use of model studies to determine the ratios of the ground level mean and gust speeds to a reference speed at a height not influenced by terrain roughness. The measured wind speed ratios are then used in conjunction with the known statistics of the reference speed to predict the ground level climate. Comparisons between predicted and observed ground level wind speeds at a meteorological station showed satisfactory agreement over a 5-year period. (Author summary modified)

57239 **APTIC NO. 73142**

Walton, John J.

DISPERSION OF SST EXHAUST PLUMES IN THE STRATOSPHERE. *Preprint, International Association of Meteorology and Atmospheric Physics and IAPSO, 21p., Jan. 11, 1974. 7 refs. (Presented at the International Conference on the Structure, Composition and General Circulation of the Upper and Lower Atmospheres and Possible Anthropogenic Perturbations, Melbourne, Australia, Jan. 14-25, 1974.)*

NTIS: UCRL-74886

The sensitivity of stratospheric ozone to the dispersion of supersonic transport exhaust plumes is examined using a single box kinetics model that includes the effects of diffusive transport for the flight corridor. The problem of the perturbation of an ambient environment by the presence of a flight corridor is treated as that of a source, balanced by chemical kinetics and transport, driving the system to a new equilibrium. Corridor center concentrations of nitric oxide, nitrogen dioxide, nitric acid vapor, and ozone are illustrated as a function of time for a flight corridor measuring 400 km in the horizontal by 3 km in the vertical. Using as an example a corridor at an altitude of 20 km and a latitude of 45 deg north, photodissociation rates are evaluated using the noon solar flux of the autumnal equinox for a pure absorbing standard atmosphere. Ozone depletion appears to vary linearly with NOx concentration, while the balance between the odd nitrogen species varies.

57240 **APTIC NO. 72973**

Centre Scientifique et Technique du Batement

MEASUREMENT OF STRONG ACID POLLUTION ON TOP OF THE GRENELLE HIGH-RISE BUILDINGS IN THE VICINITY OF THE PARIS URBAN HEATING COMPANY FROM OCTORBER 1, 1972 TO DECEMBER 31, 1973. *(Etude de la pollution en acidite forte au sommet des tours du front de seine, voisines de la chaufferie de la compagnie parisienne de chauffage urbain. 1 Octobre 1972/31 Decembre 1973). Text in French. Centre Interprofessionel Technique d Etudes de la Pollution Atmospherique and Compagnie Parisienne de Chauffage Urbain Contract, 47p., 1974 (?).*

Acid pollution measurements were made atop three high-rise buildings situated around the Paris Urban Heating Company during the period October 1, 1972 to December 31, 1973. An analysis of pollution maximums above 1000 micrograms/cu m and meteorological conditions revealed that the pollution peaks were determined by wind conditions and temperature inversion. In no case was the responsibility for such peaks attributed to the heating company s operations.

57241 **APTIC NO. 81043**

Boatman, Joey F.

THE EFFECT OF TROPOSPHERIC TEMPERATURE LAPSE RATES ON THE ASCENT RATES OF PILOT BALLOONS. *J. Appl. Meteorol., 13(8): 955-961, Dec. 1974. 6 refs.*

The effect of temperature lapse rate on the ascent rates of spherical meteorological pilot balloons was investigated using a double theodolite tracking system. Over 50 pilot balloons were released, principally in the vicinity of Laramie, Wyoming. Equations are presented for balloon height as a function of time for various lapse rate environments. The appropriate equations are combined for a balloon passing through more than one environment. An equation is given for balloon ascent rate as a function of virtual temperature, lapse rate, altitude, and balloon diameter in any constant temperature lapse rate environment. (Author abstract modified)

57242 **APTIC NO. 81209**

RESULT OF SURVEY ON SULFUR OXIDES IN WINTER. *(Toki ni okeru io sankabutsu chosa kekka). Text in Japanese. In: Report of the Kanagawa Prefectural Coastal Area Air Pollution Survey Association, p. 64-101, Dec. 1974.*

Although sulfur oxides decreased gradually in coastal areas in Kanagawa Prefecture in recent years, the southern area showed less decrease, and some parts of that area now show as much pollution as in the coastal industrial area. A survey was made to determine the origin of pollutants in this southern area, using a statistical method and taking into consideration topographical and meteorological factors to trace the transport of sulfur oxides. This statistical method of evaluation of diffusion and transport corresponded to time sequence changes of concentration distribution actually measured. The analysis showed that pollutants tended to stay at Tokyo Bay, from Yokosuka to the Negishi area of Yokohama. However, it was not only pollutants emitted by the Tokyo-Yokohama industrial area which effected Yokosuka, but those all over Tokyo Bay, including Chiba. Pollutants tended to flow into the area along the Tama River, the residential area south of the industrial area, and along the hilly area in the center of Yokosuka. Local pollution of the Miura City area must be the effect of pollutants from emission sources within Miura Peninsula. Around Yokosuka City, pollution was affected by nearby pollution sources. Local polluted areas were found in industrial areas and congested urban areas. It is necessary to investigate pollution from nitrogen oxides, as they may be polluting these areas in the same way as sulfur oxides.

1973

57243 **APTIC NO. 81385**

Carson, D. J.

THE DEVELOPMENT OF A DRY INVERSION-CAPPED CONVECTIVELY UNSTABLE BOUNDARY LAYER. *Quart. J. Roy. Meteorol. Soc. (London), 99(421):450-467, July 1973. 22 refs.*

A model is proposed for the development of a dry convectively unstable boundary layer capped by a stable layer. A realistic knowledge of the development of the layer is required when estimating the dispersion of concentrations of atmospheric pollutants. The effects of time-dependent surface heating, the stability of the capping layer, subsidence, and any degree of turbulent interfacial mixing are included. A differential equation describing the evolution quantitatively shows the relative importance of each factor and, in particular, indicates the importance of the entrainment process. The model is applied to the 1953 O Neill boundary layer data in an attempt to assess to what degree interfacial mixing is realized in the atmosphere. Realistic boundary layer developments are obtained. (Author abstract modified)

57244 **APTIC NO. 73720**

Granat, Lennart

ON THE DEPOSITION OF CHEMICAL SUBSTANCES BY PRECIPITATION (AS OBSERVED WITH THE AID OF THE ATMOSPHERIC CHEMISTRY NETWORK IN SCANDINAVIA). *World Meteorological Organization, Geneva (Switzerland) and World Health Organization, Geneva (Switzerland), World Meteorol. Organ./World Health Organ. Tech. Conf. Observ. Meas. Atmos. Pollut., Helsinki, Finland, 1973, p. 71-78, WMO-368. 6 refs. (July 30-Aug. 4, Paper N75 11484.)*

NTIS: N75-11476-540

Data on the deposition of chemical substances by precipitation were obtained from the Atmospheric Chemistry Network in Scandinavia and compared with previous computations. The distance dependence of the correlation coefficients for the monthly deposition of calcium and sulfur was similar to that previously computed, though data from the International Meteorological Institute network showed a difference between calcium and sulfate which was more pronounced for yearly averaged data, indicating different cycles through the atmosphere. The correlation coefficient for calcium decreased to almost zero at a distance of 100-200 km from the source, implying that a given station can indicate a trend for only a small area within which the correlation between neighboring stations is fairly high. Trends in the deposition of lead and hydrogen ion were considerably different between west and east coast stations in the south of Sweden (distance about 200 km); this suggests that good areal estimates of deposition within areas with diameters on the order of 100 km are needed. A rather open but evenly spaced network is required for budget calculations of man-made pollutants. Additional collectors are needed for the North Sea and the Baltic as well as for some areas on the European continent. (Author conclusions modified)

57245 **APTIC NO. 81305**

Hoppel, W. A., J. E. Dinger, and R. E. Ruskin

VERTICAL PROFILES OF CCN AT VARIOUS GEOGRAPHICAL LOCATIONS. *J. Atmospheric Sci., 30(7):1410-1420, Oct. 1973. 22 refs.*

Measurements of the number density, volatility, and supersaturation spectra of cloud condensation nuclei during aircraft soundings to about 15,000 ft (mean sea level) over Arizona, the Central Pacific, Alaska, and in a convective region over Florida and on five flights to an altitude of 35,000 ft off the east and west coasts of the United States were made. The number of cloud condensation nuclei over continental areas away from strong anthropogenic sources was about 10 times as great as the number in marine air masses and in air masses over snow-packed polar regions. The count decreased with altitude over continental areas, whereas in the oceanic environments and polar regions the count sometimes increased above the inversion level such that a higher altitudes no systematic differences between oceanic and continental environments existed. Anomalously high counts of several thousand condensation nuclei/cu m were encountered on several occasions over the Pacific. No systematic increase or decrease in cloud condensation nuclei with altitude above 20,000 ft was observed during five soundings to 35,000 ft. About 60% of the total aerosol population above the inversion level were cloud condensation nuclei that were active at a supersaturation of 0.7% and possessed an average radius of less than 0.0000026 cm. (Author abstruct modified)

57246 **APTIC NO. 74522**

Kawamura, Takeshi

WEATHER FORECASTING AND SO2 GAS PREDICTION OF THE MIZUSHIMA AREA USING OBJECTIVE FORECASTING MATERIAL. *(Kakkhanteki yoho shiryo o mochiita Mizushima-ku no aryusan gasu no kisho yoho). Text in Japanese. Kisho Gijutsu Noto (Meteorol. Study Note), 14(1-2):74-77, Dec. 1973.*

Using sulfur dioxide concentration and meteorological data compiled during 1970 in the Mizushima area a forecasting method for SO2 concentration based on objective forecasting materials was developed. The meteorological conditions associated with high SO2 concentration are relatively low wind velocity, stability of lower atmosphere, and SW wind. As a meteorological element suitable for numerical forecasting, readily obtainable diurnal ranges with high accuracy were calculated. The direct forecasting of wind direction and velocity are difficult. Therefore, the geostrophic wind direction and velocity were obtained from the surface chart. The work sheet for forecasting the maximum SO2 concentration category by combining the data on the temperature difference between ground level and at 850 mb, geostropic wind velocity, geostrophic wind direction, and frequency distribution of occurrence of five SO2 concentration categories by each meteorological element is drawn. The classification of concentration categories was revised by trial and error method for more accurate forecasting. Two types of work sheets, one for warm weather and the other for cold weather, are given.

57247 **APTIC NO. 72950**

Klug, W.

THE TRANSPORT OF AIRBORNE MATERIAL OVER MODERATE DISTANCES. *In: NATO North Sea Science Conference. Cambridge, Mass., Massachusett Institute of Technology Press, 1973, p. 237-245. 6 refs.*

Studies concerning the transport and diffusion of airborne material over medium distances (100-500 km) are reviewed. Experiments involving the transport of radioactive material and plant spores are cited to illustrate diurnal patterns in meteorological conditions and source strength, plume behavior, vertical mixing, and the decrease in peak concentration with increasing distance from the source. A model that relates pollutant concentrations to pollutant source distributions and intensities for medium transport is described in terms of its application to the transport of sulfur emissions from fuel burning over western Europe, including the British Isles and the North Sea. The model treats the air volume under consideration as a set of discrete subvolumes; within each subvolume, the pollutant concentration and pertinent meteorological parameters are assumed to be constant in space. Sulfur emission rates were assigned to boxes of 2 deg in latitude and 2 deg in longitude, and the height of the mixed layer was assumed to be 3 km. Simulations of a 10-day episode of light southwesterly winds resulted in concentration patterns which appeared realistic though lack of appropriate data precluded quantitative validation.

57248 **APTIC NO. 81268**

London, Julius and Samuel Oltmans

FURTHER STUDIES OF OZONE AND SUNSPOTS. *Pure Appl. Geophys. (Basel), vol. 106-108:1302-1307, 1973. 9 refs.*

A statistical analysis of data on the mean annual total ozone and the annual relative sunspot number for the period 1932-1969 was performed to investigate possible relationships between sunspot activity and ozone concentration. Evidence for the existence of such a relationship tended to disappear in the noise of the data as more care was taken with the statistical analysis. The use of variations in ozone circulation patterns rather than data on total ozone is suggested for future studies of long term effects of solar activity on atmospheric ozone.

57249 **APTIC NO. 81262**

Morris, T. R. and C. W. Ulbrich

RADAR OBSERVATION OF FIRE-INDUCED RAIN CLOUDS. *J. Appl. Meteorol., 12(3):551-553, April 1973.*

Rain clouds which may have been artificially produced by a fire in southern Illinois were observed by weather radar in Greenville, Illinois on June 27, 1972. Detection of the clouds occurred approximately 55 min after the outbreak of an intense fire at a zinc smelting plant in Sandoval, Illinois. The clouds were tracked by radar through the growth and dissipation stages for about 1 hr. Initial detection of the clouds occurred at a time when little or no convective activity was in evidence. The atmosphere in the vicinity of the fire was marginally stable and was perhaps driven into an unstable condition as a result of the fire.

57250 **APTIC NO. 81270**

Oliver, H. R.

SMOKE TRAILS IN A PINE FOREST. *Weather (London), 1973:345-347, Aug. 1973. 3 refs.*

Short-term horizontal and vertical air flow motions in a forest were investigated by observing smoke trails. Smoke canisters were placed 4-6 m above the forest floor on a meteorological tower, and smoke trails were photographed from above and below the canopy. A very large variation in the direction of travel of the smoke was observed, with the flow below the canopy sometimes being in the reverse direction to the wind flow above the forest. There was adequate wind under all except very calm conditions to blow the smoke clear of the source. Wide variations in the form of the smoke trail as it passed through the trunk space were also observed. Sometimes the trail went off at a constant height for at least 100 m without spreading out or showing any marked turbulence, whereas on other occasions the smoke rose suddenly and quite quickly into and through the canopy or dropped down almost to ground level. Convective plumes of smoke were observed with vertical velocities of at least 0.5 m/sec when observations were made from above the canopy level, and the smoke appeared in almost any direction. The plumes were several meters in cross section and were clearly seen passing through the canopy up to 50 m from the source.

57251 **APTIC NO. 81053**

Podzimek, Josef

CONTRIBUTION TO THE QUESTION OF CONDENSATION NUCLEI FORMATION ON THE SEASHORE. *J. Rech. Atmospheriques, p. 138-152, May 28, 1973. 15 refs.*

Twenty-four samples of sodium chloride giant nuclei (diameter greater than 1 micron) collected on islands along south Texas during the last week of 1972 were analyzed. Total concentration of nuclei ranged from 89 nuclei to 15,160 nuclei/l of air. Size spectrum distribution curves of nuclei followed the Nukyiama-Tanassava density function. There was a strong decrease in nuclei concentration 80 m away from the surf area when the wind was from the sea. Evaluation of electron microscopic samples showed many tiny NaCl particles with the modal size approximately 0.02 micron. (Author abstract modified)

57252 **APTIC NO. 81303**

Tennekes, H.

A MODEL FOR THE DYNAMICS OF THE INVERSION ABOVE A CONVECTIVE BOUNDARY LAYER. *J. Atmospheric Sci., 30(4):558-567, May 1973. 19 refs.*

A model of the dynamics of an inversion above a convective boundary layer is described. No assumptions on the magnitude of the downward heat flux at the inversion base are needed to obtain an algebraic equation that relates the height of the inversion and the potential temperature difference to the heating history of the boundary layer and to the initial conditions. After the nocturnal inversion progresses to a point where penetrative convection can begin, the inversion base generally grows linearly with time in the morning and is proportional to the square root of time in the afternoon. (Author abstract modified)

1972

57253 **APTIC NO. 81412**

Haagen-Smit, Arie J.

THE LIGHT SIDE OF SMOG. *Chem. Technol., 2(6):330-331, 333-335, June 1972.*

Smog was passed through cold traps for collecting vapor, producing an evil-smelling liquid. It contained many organic and inorganic compounds and had a strong oxidizing action. The only possibility to account for the large quantity of ozone was that it was formed from other major pollutants. A reaction scheme was postulated involving alkyl radicals, produced by the atomic oxygen from the photodissociation of nitrogen dioxide, reacting with the surrounding oxygen molecules to form peroxyl radicals, and then with another molecule of oxygen to form ozone. Nitrogen dioxide and gasoline were allowed to react in a fumigation room in sunlight with plants as smog indicators. The experiment was successful, producing typical plant markings and smog odor. The energy of the sun is trapped by a sensitizer compound in this type of reaction, and then transferred to another compound. The reaction is discussed in which light dissociates diacetyl into free radicals and, in the presence of oxygen, ozone is formed. Mesitylene, an aromatic gasoline component, produced ozone with NO2 as a light sensitizer. Cyclohexene and dicyclopentadiene were excellent aerosol haze producers when photooxidized in the presence of oxides of nitrogen.

57254 **APTIC NO. 81585**

Nicolet, Marcel

AERONOMIC CHEMISTRY OF THE STRATOSPHERE. *Planteary Space Sci., vol. 20:1671-1702, 1972. 111 refs. (Presented at the Department of Transportation s Survey Conference on Climatic Impact Assessment Program, Cambridge, Mass., Feb. 15-16, 1972.)*

The aeronomic chemistry of the stratosphere is reviewed. The dissociation of water vapor, methane, and hydrogen in the stratosphere is brought about mainly by reaction processes with excited oxygen atoms which are produced by the photodissociation of ozone. A discrepancy between theoretical and observed concentrations of ozone in the upper stratosphere suggests two possible explanations: overly large values of solar radiation fluxes (for oxygen photodissociation), rate coefficients, and absorption cross sections or ozone reduction brought about by the effect of hydrogen compounds or nitrogen oxides. The reaction of the excited oxygen atom with methane and nitrous oxide leads to the destruction of these two molecules in the stratosphere which corresponds to the production of carbon monoxide (with water vapor) and nitric oxide, respectively. The vertical distribution of water vapor is not affected by its dissociation in the stratosphere since its reformation is rapid. The fact that the ratio of hydroxyl and hydroperoxyl radical concentrations cannot be determined with adequate precision complicates the calculation of ozone destruction which occurs through reactions of OH and HO2 radicals with atomic oxygen in the upper stratosphere and with carbon monoxide and NO in the lower stratosphere. The same difficulty arises in connection with the dissociation of nitric acid molecules formed by the reaction of OH radical and nitrogen dioxide. An additional difficulty involves the fact that NO concentrations are not well known at the stratopause level. (Author abstract modified)

57255 **APTIC NO. 81116**

Slinn, W. G. N.

RESIDENCE TIME OF PARTICLES IN URBAN AIR. *Preprint, Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., 4p., 1972. 6 refs.*

A previously published mathematical error is pointed out. The error resulted in neglecting the time change of the extinction cross section in calculating the ratio of original turbidity to turbidity at a later time. The time dependence of the turbidity is recalculated. The approximations used are shown. Separate equations are obtained for urban and rural areas. These equations are used to calculate reductions in turbidity which differ from those previously obtained. Noticeable variations in turbidity probably occur because of changes in air masses or humidity as well as changes in source strength. It is also uncertain whether the previous expression for the removal time constant correctly described the dependence of the removal on particle size.

BASIC SCIENCE AND TECHNOLOGY

1976

57256 **APTIC NO. 81428**

Anastasi, Christopher, Peter P. Bemand, and Ian W. M. Smith

RATE CONSTANTS FOR: OH PLUS NO2 (PLUS N2) FORMS HNO3 (PLUS N2) BETWEEN 220 AND 358 K. *Chem. Phys. Letters (Amsterdam), 37(2):370-372, Jan. 15, 1976. 14 refs.*

Rate constants for the formation of nitric acid (plus nitrogen) resulting from the reaction of hydroxyl radical with nitrogen dioxide (plus nitrogen) are determined by using time-resolved resonance absorption to follow the removal of OH radicals produced by the flash photolysis of HNO3. Effective second-order rate constants useful for stratospheric modelling calculations are presented for temperatures between 220 and 358 K and for nitrogen concentrations between 3.2 times 10 to the 17 and 4.0 times 10 the 18 molecules/cu cm. The reaction appears to pass through a transition between second- and third-order kinetics at pressures where direct rate measurements are relatively straightforward.

57257 **APTIC NO. 81557**

Babu, S. V., Y. V. Chalapati Rao, and V. Subba Rao

RESONANCE ENERGY EXCHANGE EFFECTS IN ATMOSPHERIC TRANSMISSION DUE TO POLLUTANTS. *Chem. Phys. Letters (Amsterdam), 37(2):253-255, Jan. 15, 1976. 9 refs. (Presented at the International Laser Radar Conference, 6th, Sendai, Japan, Sept. 3-6, 1974.)*

The effect of resonant energy exchange between two gases on their steady state adsorption of infrared radiation is discussed in their relation to the duration of the initial cooling expected during the transmission of a 10.6-micron laser beam. The effective quenching rate of carbon dioxide by hydrocarbon pollutants in the atmosphere is calculated at 608/sec as compared with 70/sec for atmospheric nitrogen. Sulfur dioxide is estimated to contribute about 10/sec to the quenching rate. Thus quenching of CO_2 by pollutants provides an alternate and more efficient drain for the laser beam energy to enter into translation, thus decreasing the time delay and initial cooling period even at pollutant concentrations of less than 10 ppm.

57258 **APTIC NO. 81496**

Byler, D. M. and D. F. Shriver

THE VIBRATIONAL SPECTRA OF ANTIMONY PENTAFLUORIDE-SULFUR DIOXIDE (1/1). *Inorg. Chem., 15(1):32-35, Jan. 1976. 20 refs.*

Complete solid state Raman and infrared spectra are reported for the antimony pentafluoride-sulfur dioxide (1:1) complex, and assignments are made for the fundamental vibrations. Depolarization data are reported for the liquid-phase Raman spectra. The antimony-oxygen stretch in the complex is assigned to a band at 266/cm; this falls at a lower energy than does antimony-nitrogen for the analogous acetonitrile complex of antimony pentafluoride. The three fundamental vibrations ascribed to the sulfur dioxide moiety of the antimony pentafluoride-sulfur dioxide complex are assigned to Raman bands at around 1320, 1100, and 539/cm; these are shifted approximately -15, -45, and +15/cm from the values found for the equivalent modes in free sulfur dioxide. Qualitatively, other sulfur dioxide complexes show the same kind of shift, regardless of their mode of bonding. The difference between the two high frequency bands, however, appears to be symptomatic: if the difference is greater than 190/cm, the complex is oxygen bonded; whereas, if the difference is less than 190/cm, the complex is bonded through the sulfur (free sulfur dioxide liquid displays a difference between the two high frequency bands of approximately 190/cm). Author abstract modified)

57259 **APTIC NO. 81406**

Gay, Bruce W., Jr., Philip L. Hanst, Joseph J. Bufalini, and Richard C. Noonan

ATMOSPHERIC OXIDATION OF CHLORINATED ETHYLENES. *Environmental Sci. Technol., 10(1):58-67, Jan. 1976. 24 refs.*

Ethylene and chlorinated ethylenes were photooxidized in air in the presence of nitrogen dioxide with ultraviolet light. Analyses were performed by long-path infrared spectroscopy, wet chemical, and chemiluminescent procedures. The reactivity of 1,1-dichloroethylene is greater than that of 1,2 dichloroethylene-trichloroethylene, which is greater than that of ethylene, which is greater than that of vinyl chloride, which is much greater than that of tetrachloroethylene. The reaction sequence involves photolysis of nitrogen dioxide, formation of ozone, conversion of the olefinic compounds to a highly oxygenated intermediate, attack by the intermediate on olefin and nitric oxide molecules, formation of transitory epoxides, and rearrangement of epoxides through chlorine atom movement to yield chlorinated acetaldehyde or chlorinated acetyl chloride. The chlorinated aldehydes are further oxidized to more stable final products, including a small yield of chlorinated peroxyacetyl nitrates. (Author abstract)

57260 **APTIC NO. 81624**

Gay, Bruce, W., Jr., Richard C. Noonan, Joseph J. Bufalini, and Philip L. Hanst

PHOTOCHEMICAL SYNTHESIS OF PEROXYACYL NITRATES IN GAS PHASE VIA CHLORINE-ALDEHYDE REACTION. *Environ. Sci. Technol., 10(1):82-85, Jan. 1976. 11 refs.*

A new peroxyacyl nitrate (PAN) synthesis in the gas phase was developed. Molecular chlorine is photolyzed to yield chlorine atoms that abstract aldehydic hydrogen from the aldehyde. The acyl radical then adds oxygen and nitrogen dioxide to form the PAN. Any member of the PAN family can thus be produced from its parent aldehyde cleanly and in very high yield. (Author abstract)

57261 **APTIC NO. 81459**

Kurylo, Michael J. and Walter Braun

FLASH PHOTOLYSIS RESONANCE FLUORESCENCE STUDY OF THE REACTION CL PLUS O_3 GIVES CLO PLUS O_2 OVER THE TEMPERATURE RANGE 213-298 K. *Chem. Phys. Letters (Amsterdam), 37(2):232-235, Jan. 15, 1976. 7 refs.*

The kinetics of the reaction of chlorine atom with ozone to produce the chloroxy radical and oxygen were studied to obtain input for predictive schemes of stratospheric ozone destruction. Rate constants of between 1.5 and 1.7 times lower than those previously recommended were obtained for a temperature of 300 K, and a value nearly a factor of 2.5 lower was obtained for a temperature of 220 K. The lower values imply a reduction in the predicted effect of chlorine atom-catalyzed destruction of stratospheric ozone.

57262 **APTIC NO. 81425**

McCarty, J. G. and R. J. Madix

THE ADSORPTION OF CO, H_2, CO_2 AND H_2O ON CARBURIZED AND GRAPHITIZED NI(110). *Surface Sci., 54(1):121-138, Jan. 1976. 33 refs.*

The adsorption/desorption behavior of carbon monoxide, water vapor, carbon dioxide, and hydrogen on carburized and graphitized nickel(110) was studied to assess the importance of surface carbon on the binding energies and adsorption behavior of these molecules. The carbide surface adsorbed CO and H_2O in amounts comparable to those adsorbed on a clean surface; however, unlike clean Ni(110) it did not appreciably adsorb H_2. The binding energy of CO on the carbide surface was coverage sensitive, decreasing from 21 to 12 kcal/mol as the CO coverage approached 1.1 times 10 to the 15 molecules/sq cm at 200 K. The initial sticking probability and maximum coverage of CO on the carbide surface were close to that observed for clean Ni(110). The amount of H_2, CO, CO_2, and H_2O adsorbed on graphitized Ni(110) was insignificant relative to the clean surface. The kinetics of the adsorption/desorption processes observed are also discussed.

57263 **APTIC NO. 81126**

Mihail, R. and C. Iordache

PERFORMANCES OF SOME NUMERICAL TECHNIQUES USED FOR SIMULATION OF FIXED BED CATALYTIC REACTORS. *Chem. Eng. Sci., 31(1):83-86, 1976. 9 refs.*

Problems in interpreting the results of numerical techniques used for simulation of fixed catalytic reactors were investigated. Three solutions are compared: analytical, implicit Crank-Nicolson, and an explicit method obtained by Leu modifying the Sauliev s method. The bidimensional model of a fixed bed catalytic reactor is resolved by the three numerical methods and compared to the results obtained by simulation.

57264 **APTIC NO. 81602**

Miranda, Rogelio D., Donald B. Robinson, and Harish Kalra

EQUILIBRIUM-PHASE PROPERTIES OF PROPANE-CARBONYL SULFIDE SYSTEM. *J. Chem. Eng. Data, 21(1):62-65, Jan. 1976. 12 refs.*

Vapor and liquid equilibrium-phase compositions and refractive indices were determined for the propane-carbonyl sulfide system at 20, 60, 100, 140, and 180 F from the vapor pressure of propane to the vapor pressure of carbonyl sulfide. The refractive index of either phase viewed in an observation port was calculated from measurements made using a special window and mirror arrangement and an autocollimating telescope. These made it possible to obtain the minimum angle of deviation of a ruby laser ray passed through the window and cell contents, reflected off the mirror, and back out through the window. Samples of both liquid and vapor were withdrawn for analysis at each experimental condition, and refractive index measurements were made on each phase. The phase compositions were determined with a gas chromatograph equipped with a thermal conductivity cell detector. Although azeotropic tendencies existed toward the higher concentration range for each component, no azeotrope was found at any temperature up to 180 F. The equilibrium ratios were calculated for each component at each temperature from the phase composition data. The equilibrium-phase densities were calculated from the measured phase composition and refractive index data by use of the Lorentz-Lorenz molar refractivity relationship. (Author abstract modified)

57265 **APTIC NO. 81447**

Pilat, M. J. and A. Prem

CALCULATED PARTICLE COLLECTION EFFICIENCIES OF SINGLE DROPLETS INCLUDING INERTIAL IMPACTION, BROWNIAN DIFFUSION, DIFFUSIOPHORESIS AND THERMOPHORESIS. *Atmos. Environ., 10(1):13-19, 1976. 19 refs.*

Particle collection efficiencies of a single 100-micron (diameter) water droplet were calculated with a Runge-Kutta numerical solution for the particle equation of motion. Mechanisms of inertial impaction, Brownian diffusion, diffusiophoresis, and thermophoresis were taken into account. The bulk gas properties were held constant at 65 C and 100% relative humidity, and the water droplet temperature ranged from 10 C (water vapor condensing on the droplet) to 82 C (water evaporating from the droplet). Potential flow was assumed for the gas flow profile around the droplet moving at its settling velocity of 30.0 cm/sec. Over the 0.01-10-micron particle size range, the calculated particle collection efficiency was significantly increased with colder water temperatures and decreased with warmer water temperatures. Calculated results for the case with both the water and gas temperature at 65 C (only inertial impaction and Brownian diffusion mechanisms) compared reasonably well with previous reports. The results are relevant both to the control of particulates with spray scrubbers and the scavenging of atmospheric aerosols by cloud and rain droplets.

57266 **APTIC NO. 81636**

Simonaitis, R. and Julian Heicklen

REACTIONS OF HO2 WITH NO AND NO2 AND OF OH WITH NO. *J. Phys. Chem., 80(1):1-7, Jan. 1, 1976. 15 refs.*

The reaction of HO2 with nitric oxide was studied at approximately 23 C in competition with the reaction in which 2HO2 forms hydrogen peroxide + oxygen. The competition for HO2 between NO and nitrogen dioxide was studied by monitoring NO removal via the chemiluminescent detection of NO. The HO2 radicals were produced either by nitrous oxide or NO photolysis at 213.9 nm in the presence of O2 and excess hydrogen. Two possible paths for the reaction of HO2 with NO are HO2 + NO yields hydroxyl ion + NO2 and HO2 + NO yields HONO2. If the constant of the reaction forming H2O2 and O2 is taken as 3.3 times 10 to the -12th power cu cm/sec, then the constant of the reaction forming HO and NO2 is (1.0 - 0.2) times 10 to the -12 power cu cm/sec and that of the formation of HONO2 is less than 2 times 10 to the -15th power cu cm/sec. If an HO2NO intermediate is formed, its lifetime is less than 2 sec. With NO2 a complex set of reaction occurs: HO2 + NO2 yields nitrous acid + O2 and HO2 + NO2 reacts reversibly to form HO2NO2 and possibly HO2NO2 yields HONO + O2. The intermediate HO2NO2 has a lifetime of about 50 sec and causes NO to be oxidized after the irradiation is terminated. A detailed analysis of the mechanism yields an equation relating the lifetime of HO2NO2 with the fundamental rate coefficients. Information was also obtained on the reaction by which OH + NO (+M) forms HONO(+M). The values obtained for its rate constant were 3.7 times 10 to the -12th power cu cm/sec at approximately 100 torr of H2 and 1.1 times 10 to the -11th power cu cm/sec at approximately 730 torr of H2, in good agreement with recent literature values. (Author abstract modified)

57267 **APTIC NO. 81449**

Stockburger, L., III. and J. Heicklen

THE INHIBITION OF PHOTOCHEMICAL SMOG - IV. EFFECT OF DIETHYLHYDROXYLAMINE ON PARTICLE PRODUCTION. *Atmos. Environ., 10(1):51-55, 1976. 12 refs.*

The free radical inhibitors aniline and diethylhydroxylamine were added to an irradiated system containing nitric oxide, propylene, sulfur dioxide, water vapor, oxygen, and nitrogen to investigate the effects of the inhibitors on photochemical smog production. The particle number density, which was monitored as a function of irradiation time for particles with diameters greater than 25 A, depended strongly on the cell wall conditions. No particles were produced in a freshly cleaned cell with relatively small concentrations of SO2, C3H6, NO, and DEHA, whereas particles were produced after the cell was conditioned by repeated experiments. The time histories, maximum values of particle number density, or the times to reach the maxima were not markedly altered (less than a factor of 2) by the addition of the photochemical inhibitors at 5-25% of the C3H6 concentrations, either in the absence or presence of SO2. (Author abstract modified)

57268 **APTIC NO. 81301**

Von Doesburg, H. and W. A. De Jong

TRANSIENT BEHAVIOR OF AN ADIABATIC FIXED-BED METHANATOR--I. EXPERIMENTS WITH BINARY FEEDS OF CO OR CO2 IN HYDROGEN. *Chem. Eng. Sci., 31(1):45-51, 1976. 11 refs.*

The transient behavior of an adiabatic fixed bed catalytic reactor was investigated using the hydrogenation of small amounts of carbon monoxide and carbon dioxide to methane as the test reactions. The axial temperature profile in a 0.5 l reactor containing a nickel/alumina catalyst was measured as a function of time after applying changes of the carbon oxide concentration in the feed and of the feed temperature. A quasi homogeneous model was developed to simulate the transient behavior of the reactor. Its partial differential equations were solved numerically using the Crank Nicholson algorithm. The agreement between measured and calculated reactor responses was quite good at carbon oxide concentrations up to 2.2 vol%, an inlet temperature below 250 C, and in the space velocity range of 5000-25,000/hr, under which conditions the reaction was so slow that mass and heat transfer limitations did not occur. (Author abstract modified)

57269 **APTIC NO. 81603**

Yamamoto, Sachio, James B. Alcauskas, and Thomas E. Crozier

SOLUBILITY OF METHANE IN DISTILLED WATER AND SEAWATER. *J. Chem. Eng. Data, 21(1):78-80, Jan. 1976. 18 refs.*

The solubility of methane in distilled water and in seawater at three salinities was determined. Measurements were made by the Scholander microgasometric technique. Measurements were made at several temperatures for waters of a given salinity. The volumes of absorbed gas and of the water were measured. Bunsen solubility coefficients were calculated from the observed volumes. Accuracy was estimated at 0.5%. The experimental data were fit by the least-squares method to an established equation. A table of Bunsen solubility coefficients covering the temperature range -2 to 30 C and the salinity range 0 to 40 parts/thousand was calculated from the fitted equation. For seawater of salinity 3.4%, the Bunsen coefficients ranged from 0.04489 at 0 C to 0.02368 at 30 C. Solubility values for distilled water were in agreement with some of those previously reported and 3 to 5% higher than others. (Author abstract modified)

57270 **APTIC NO. 81458**

Yoshida, Tetsuo, Yasuo Kousaka, and Kikuo Okuyama

GROWTH OF AEROSOL PARTICLES BY CONDENSATION. *Ind. Eng. Chem. Fundamentals, 15(1):37-41, Feb. 1976. 7 refs. (Presented at the Chemical Engineering Meeting, Japan, April 1974.)*

The rate and extent of growth of submicron aerosol particles introduced into a supersaturated atmosphere of water vapor were investigated. The growth rate of particles undergoing condensation was very rapid. The volume-mean diameter of the grown particles was determined by the number concentration of aerosol particles and the initial state of supersaturation in the surrounding gas. The supersaturation which was necessary to cause condensation of the water vapor around the particles was produced by mixing hot saturated air with cold air. Particle growth by condensation appears to be a promising preconditioning technique for industrial dust collection. (Author abstract modified)

57271 **APTIC NO. 81538**

Zahniser, M. S., F. Kaufman, and J. G. Anderson

KINETICS OF THE REACTION CL PLUS O3 GIVES CLO PLUS O2. *Chem. Phys. Letters (Amsterdam), 37(2):226-231, Jan. 15, 1976. 25 refs.*

The bimolecular rate constant for the reaction between chlorine atom and ozone which results in the production of chloroxy radical and oxygen was measured over the temperature range of 210-360 K in a discharge flow system. Chlorine atom resonance fluorescence at 134.72 nm was used to monitor the decay of Cl under pseudo first order conditions. The value for the rate constant at stratospheric temperatures (240-270 K) appeared to be about 40% lower than that used in early calculations which modeled ozone destruction. (Author abstract modified)

1975

57272 **APTIC NO. 81213**

Ambrosio, M., A. D Alessio, A. Di Lorenzo, and G. Russo

INCOMPLETE COMBUSTION OF METHANE FOR THE PRODUCTION OF INTERMEDIATE COMPOUNDS FOR THE CHEMICAL INDUSTRY. *Riv. Combust., 29(7-8):282- 291, July-Aug. 1975. 30 refs. (Presented at the Italian Flame Days, Sanremo, Italy, April 10-11, 1975.)*

Product evolution in the partial combustion of methane was studied in premixed methane-oxygen flames produced on a flat flame burner at atmospheric pressure. Ethane, ethylene, the major part of acetylene, and small quantities of soot were formed before the total consumption of molecular oxygen. After total oxygen consumption, acetylene concentration had a peak and later diacetylene, vinylacetylene, and benzene showed a maximum concentration; soot and polycyclic aromatic hydrocarbons increased continuously along the flame. When the initial temperature was raised, with the inlet CH4:O2 ratio constant, the acetylene concentration increased, while the concentration of both diacetylene and soot decreased. The kinetic analysis of the data indicated that the decomposition of methane could not be treated as a series of consecutive dehydrogenation reactions. The disappearance rate of methane in the oxidative pyrolysis was consistent with the values found in the thermal pyrolysis of methane; while the observed velocity of formation of diacetylene from acetylene in methane oxygen flames was lower for the competing effects of the oxidation process. The calculated surface growth rates of soot particles correlated well with the concentration profiles of diacetylene, showing that this compound is an important intermediate in the soot formation process. (Author abstract modified)

57273 **APTIC NO. 81216**

Ambrosio, M., F. Beretta, A. D Alessio, and A. Di Lorenzo

ANALYTICAL TECHNIQUES IN THE STUDY OF POLLUTANTS EVOLUTION IN RICH METHANE-OXYGEN FLAMES. *Riv. Combust., 29(7-8):337-348, July-Aug. 1975. 17 refs. (Presented at the Italian Flame Days, Sanremo, Italy, April 10-11, 1975.)*

Recent advances in optical and chemical diagnostic techniques, used for the study of the formation and evolution of soot particles, polycyclic aromatic hydrocarbons (PCAH), and gaseous compounds in rich fuel methane-oxygen flames are discussed. The temperature profiles of the gases and of the soot particles are determined with the sodium D line reversal and the Kurlbaum methods. Concentration profiles of reactants and gaseous products along the flame for different CH4:O2 feed ratios and for different inlet gas flow rates are obtained by cooled probe sampling in line with a gas chromatograph or a mass spectrometer. The size of soot particles, their growth and number concentration evolution in flames are determined by a laser light scattering technique. The soot mass concentrations calculated from the optical data are compared with those obtained by samples withdrawn from the flames. The collected material has been characterized by hydrogen/carbon atomic ratio and its volatile content determined by thermogravimetric analysis combined with gas chromatographic and spectrometric techniques. The total concentration of PCAH as well as the individual PCAH profiles have also been followed in the flame. (Author abstract modified)

57274 **APTIC NO. 81367**

Beilke, S., D. Lamb, and J. Mueller

ON THE UNCATALYZED OXIDATION OF ATMOSPHERIC SO2 BY OXYGEN IN AQUEOUS SYSTEMS. *Atmos. Environ., 9(12):1083-1090, 1975. 25 refs.*

Experimental results are presented which partially resolve discrepancies in the amount of sulfate predicted previously as forming through the oxidation of sulfur dioxide by molecular oxygen in aqueous solution. The rate of sulfate formation was measured in buffered solutions over the atmospherically interesting pH range of 3 to 6, at 3 and 25 C. No temperature dependence was measurable. The rate of sulfate formation was nearly inversely proportional to the square of thee positive hydrogen ion concentration. The concept of a normalized rate of sulfate formation was used to compare various models. Sulfite is apparently oxidized in simple systems by molecular oxygen in the rate-determining step. The small deviation from the inverse proportionality may indicate that the reaction has an order slightly greater than unity with respect to sulfite. If a first order reaction is assumed, the rate constant has a very weak dependence of pH. For atmospheric sulfur dioxide in contact with a cloud having a nominal liquid water content of 1 g/cu m, SO2 removal rates are estimated to lie between approximately 10 to the -5th power and 15%/hr for pH values between 3 and 6. (Author abstract modified)

57275 ***APTIC NO. 81168***

Betta, R. A. Dalla

CARBON MONOXIDE ADSORPTION ON SUPPORTED RUTHENIUM. J. Phys. Chem., 79(23):2519-2525, Nov. 1975. 16 refs.

The infrared spectra of carbon monoxide adsorbed on alumina supported ruthenium catalysts revealed one band when the metal particles are large, and three bands when the particles are small. One band was assigned to CO adsorbed on low index planes of the ruthenium, while two of the bands are associated with CO adsorbed on low coordination edge and corner metal atoms. Comparison of CO adsorption to hydrogen adsorption revealed CO/H ratios as high as 4 on Ru particles of 11 A diameter, implying mutliple adsorption of CO on low coordination sites. This was supported by the observed CO stretching frequencies, which approached the values reported for the known carbonyls of Ru. A simplified molecular orbital approach was applied to CO adsorption on Ru. This treatment was inadequate to explain the behavior of Ru and the differences observed between CO adsorption on Ru and platinum. (Author abstract modified)

57276 **APTIC NO. 81279**

Brock, J. R. and W. H. Marlow

CHARGED AEROSOL PARTICLES AND AIR POLLUTION. *Environ. Letters, 10(1):53-67, 1975. 8 refs.*

The general importance and possible environmental effects of charged aerosol particles are examined. There are many technical applications of aerosol charging. In air pollution monitoring the electrical mobility analyzer is entirely dependent upon artificial particle charging. Atmospheric conductivity monitoring is implicitly dependent upon natural aerosol charging. In air pollution control, electrostatic precipitation and electrical enhancement of both filtration and scrubbing efficiency depend upon the ability of particles to capture charges. Environmental effects include particle coagulation, dry deposition, and deposition in the lung. Problems in aerosol charging are reviewed as they pertain to various technical operations in air pollution control. (Author abstract modified)

57277 **APTIC NO. 78123**

Castleman, A. W., Jr., Richard E. Davis, H. R. Munkelwitz, I. N. Tang, and William P. Wood

KINETICS OF ASSOCIATION REACTIONS PERTAINING TO H2SO4 AEROSOL FORMATION. *Intern. J. Chem. Kinet., vol. 1975:629-640, 1975. 38 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The rates of oxidation of sulfur dioxide by hydroxyl radical were measured at room temperature using steady-state photolysis of mixtures of water, SO2, and carbon monoxide in nitrogen. The pseudo-second-order rate constant was 6.0 times 10 to the -13 cu cm/molecule/sec at a total pressure of 760 torr. A rate constant of 9.1 times 10 to the -13 cu cm/molecule/sec was obtained for the reaction of sulfur trioxide with water at room temperature and total pressures of from 1.0 to 1.3 torr. The results indicated that under certain conditions new aerosols can form in both the troposphere and the stratosphere. (Author abstract modified)

57278 **APTIC NO. 81145**

Echigoya, Etsuro, Hiroo Niiyama, Atsushi Ebitani, Hiroshi Iida, and Tomohiro Ookawa

CATALYTIC REDUCTIONS OF NO WITH H2, CO OR NH3 OVER SUPPORTED METAL OXIDE CATALYSTS. *Bull. Japan Petrol. Inst., 17(2):232-235, Nov. 1975. 6 refs.*

The roles of reducing agents such as hydrogen, carbon monoxide, and ammonia in catalytic reduction of nitric oxide over supported metal oxide catalysts were studied from the viewpoint of reaction mechanisms. Ferric oxide and gamma aluminum oxide, and cupric oxide and gamma aluminum oxide catalysts were used. A flow method was used to investigate the reactions of NO with H2 and CO. A closed gas recycling apparatus was used for the reaction of NO with NH3. The roles of H2 or CO are to reduce the catalyst which has been preoxidized by NO. Ammonia or fragments of NH3 directly reacted with the adsorbed NO. These differences of the roles of reducing agents in the reaction mechanism satisfactorily explain some features of catalytic removal of NO. (Author abstract modified)

57279 **APTIC NO. 81219**

Galbas, Hans Georg

ESTIMATING AND TESTING METHODS FOR THE AVERAGE LOGNORMAL DISTRIBUTION OF KNOWN AND UNKNOWN VARIANCE. *(Schaetz- und Testmethoden fuer den Erwartungswert einer lognormal verteilten Grundgesamtheit). Text in German. Staub, Reinhaltung Luft, 35(12):448-452, Dec. 1975. 7 refs.*

Methods of estimating and testing the mean of a lognormal distribution for known and unknown variance are presented. The maximum likelihood, the minimum unbiased variance, and the minimal mean square error estimators are stated, where the latter exists only for known variance. For fixed sample sizes, uniformly and powerfully unbiased tests for the hypothesis H subscript O:EX equals m against H subscript 1:EX does not equal m are presented for known and unknown variance. In the case of known variance, a sequential test for the above test problem is given.

57280 **APTIC NO. 81382**

Haber, J., J. Ptaszynski, and J. Sloczyński .

ADSORPTION OF CARBON MONOXIDE BY ZINC-EXCHANGED ZEOLITE X. *Bull. Acad. Polon. Sci. Ser. Sci. Chim., 23(8):709-716, 1975. 5 refs.*

Adsorption isotherms and isosteric heats of adsorption of carbon monoxide on zinc-sodium-X zeolite were determined for a series of samples of different degree of exchange. Total adsorption was a sum of two effects: specific interaction of CO with Zn ions in positions accessible for CO which can be described by the Langmuir adsorption isotherm, and nonspecific interaction which obeys the equation of Henry s isotherm. Assuming the number of CO molecules absorbed specifically as a measure of a number of accessible Zn ions, the distribution of Zn ions in zeolite X was determined. Zinc (++) ions filled in the first place the half of sites I and then filled positions I prime and II, with a distinct tendency to favor sites I prime. (Author abstract modified)

57281 **APTIC NO. 81634**

Hall, W. D. and K. V. Beard

ELECTROSTATIC FORCE BETWEEN A CONDUCTING SPHERE AND A DIELECTRIC SPHERE. *Pure Appl. Geophys. (Basel), 113(4):515-524, 1975. 5 refs.*

When droplets interact with weakly charged aerosol particles it is important to consider the electric forces in addition to the dynamic forces for describing the interaction between a charged drop and an aerosol particle. While the coulomb force between assumed point charges may be a good approximation to the force between charged particles at large separations it is inadequate at small separations due to the presence of image charge forces. The force between a charged conducting sphere and an uncharged dielectric sphere is computed and given in terms of a force coefficient which depends on the relative geometry of the two spheres and the dielectric constants of the spheres and the medium. Approximate solutions for the force between a charged conducting sphere and a charged dielectric sphere are also presented. (Author abstract modified)

57282 **APTIC NO. 81127**

Kerrebrock, J. L.

EFFECT OF COMPRESSION RATIO ON NOX PRODUCTION BY GAS TURBINES. *J. Aircraft, 12(9):752-753, Sept. 1975. 6 refs.*

The effect of a compression ratio on nitrogen oxides production by gas turbines was investigated. A higher NOx fraction in the exhaust is not necessarily a result of increased compression ratio and turbine inlet temperature, even for currently available burner technology. For constant combustion efficiency in a given combustor design, NOx is nearly independent of combustor inlet temperature. Nitrogen oxides production in high pressure ratio engines is reduced by designing for the maximum primary zone residence time consistent with combustion efficiency at full power, and then achieving satisfactory part throttle combustion efficiency by some scheme such as compressor outlet bleed or combustor bypass.

57283 **APTIC NO. 73903**

Kolar, Joergen

ALDEHYDES - AN IMPORTANT GROUP OF AIR POLLUTING SUBSTANCES? *(Aldehyde - eine bedeutsame Gruppe luftverunreinigender Stoffe)? Text in German. TUE (Tech. Ueberwach.), 16(3):68-78, March 1975. 112 refs.*

The formation of aldehydes as air pollutants is described and the emission sources of aldehydes are surveyed to assess the pollution hazards due to these compounds. Aldehydes, formed in incomplete combustion processes, irritate the mucosa, eyes, and skin. Their toxicity generally decreases with their molecular weight, in the order of unsaturated aldehydes, saturated aldehydes, and aromatic aldehydes, except for furfurol. Aldehydes also cause necrosis in plants when present even in rather low concentrations. Due to their oxidation and decomposition, the aldehyde emissions generally decrease with increasing temperature. The fuel-dependent specific emission decreases in the order of fuel oil, gas, and bituminous coal. Formaldehyde, acetaldehyde, and acrolein are the principal aldehydes generated by internal combustion engines, while benzaldehyde and tolualdehyde are formed in negligible quantities. The overall aldehyde emission decreases with increasing aromatic content, and has a maximum at an air-excess coefficient of 1.2-1.3. The aldehyde formation is a function of such parameters as combustion chamber and chamber wall temperatures, and the load condition. The aldehyde emission can be decreased by increasing the compression ratio, the use of baffles in the suction canal, or by the use of fuel additives, such as ferrocene, methylcyclopentadienyl manganese tricarbonyl, or cyclohexanole nitrate. Aldehydes are also generated during the regeneration of cat-cracker catalysts in petroleum refineries, cokeries, in the surface treatment and food processing industries. Aldehyde concentration measurements in cities with busy traffic revealed concentrations far below the maximum allowable levels. Traffic-generated aldehydes as air pollutants are insignificant in comparison with carbon monoxide and benzo(a)pyrene emissions.

57284 **APTIC NO. 81354**

Lukin, L. V. and B. S. Yakovlev

PHOTOCONDUCTIVITY EVIDENCE FOR THE FORMATION OF N2O-BY THE RADIOLYSIS OF HYDROCARBON SOLUTIONS OF NITROUS OXIDE. *Text in Russian. Int. J. Radiat. Phys. Chem., 7(6):667-677, 1975. 21 refs.*

The photoconductivity of iso-octane (2,2,4-trimethylpentane) solutions of nitrous oxide induced by a pulse of light in the wavelength range from 360 to 900 nm after an X-ray pulse was determined. The amplitude Iph of the photocurrent pulse for a 10 to the 14th power molecules/cu cm N2O solution decreased with a characteristic time, as the time between the X-ray pulse and the light pulse increased. The photoconductivity was due to photodetachment of the electron from the ion N2O(-). The decrease of Iph with increasing time was associated with the instability of the ion. On the basis of the temperature dependence of time, a dissociation energy 0.5 + or - 0.1 eV for the N2O(-) ion in the iso-octane was obtained.

57285 **APTIC NO. 81454**

Lushnikov, A. A. and V. I. Smirnov

STATIONARY COALESCENCE AND PARTICLE SIZE DISTRIBUTION OF ATMOSPHERIC AEROSOLS. *Bull. Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk. SSSR, Fiz. Atmosfery i Okeana), 11(2):83-89, Sept. 1975. 19 refs.*

The relationship between stationary coalescence and atmospheric aerosol particle size distribution is mathematically analyzed. Asymptotic power low solutions are given for stationary equations of coalescence in which the coalescence coefficient is a homogeneous function of the particle masses. The power law distributions appear in the stationary coalescence of aerosols; thus the coalescence mechanism may be responsible for the appearance of the atmospheric aerosol particle size distributions.

57286 **APTIC NO. 78119**

Matsuda, S. and S. H. Bauer

THE HIGH TEMPERATURE OXIDATION OF METHYL MERCAPTAN (SHOCK WAVES). *Intern. J. Chem. Kinet., vol. 1975:463-475, 1975. 13 refs. (Presented at the Symposium on Chemical Kinetics Data for the Upper and Lower Atmosphere, 1st, Warrenton, Va., Sept. 15-18, 1974.)*

The high temperature oxidation of methyl mercaptan was studied with a single pulse shock tube technique to investigate undesirable by-product formation resulting from the combustion of carbonaceous fuels. Mixtures of CH3SH and oxygen, highly diluted in argon, were shock heated to temperatures between 1100 and 1850 K at a total density of 0.000025 mol/cu cm for a duration of about 450 microseconds. Oxygen-rich mixtures (2% CH3SH and 6.5% O2) showed characteristics of a chain branching reaction; after an induction period, a rapid pressure rise occurred indicative of an explosion. The product analysis showed complete combustion to water vapor, carbon dioxide, and sulfur dioxide. In contrast, the oxygen-lean mixtures (2% SH3SH and 3.6% O2 or 2% CH3SH and 2% O2) did not clearly indicate a chain branching process nor an explosion. The major carbon bearing species in the O2-lean mixtures at low temperatures (less than 1800 K) was methane, indicating that methyl radicals formed as a result of the dissociation of CH3SH attacked the sulfhydryl group in the mercaptan much faster than they reacted with oxygen at these temperatures. Rate data obtained for the reactions indicated that little hope exists for minimizing the production of SO2 under conditions which maximize the extent of combustion. (Author abstract modified)

57287 **APTIC NO. 81295**

Miller, Charles W., Wayne V. Kessler, and Virgil L. Anderson

THE WATER-TO-AIR TRANSFER OF 35SO4(--) BY BURSTING BUBBLES. *Environ. Letters, 10(1):1-12, 1975. 18 refs.*

The transfer of 35SO4(--) ion from water to air by bursting bubbles was studied as a function of three levels each of three variables in a bubbling solution. The variables were pH, surfactant concentration, and sodium 35 sulfate concentration. Sterile water solutions containing different combination of the above factors and a fixed amount of 22 sodium chloride were bubbled in an enclosure for 1 hr. Samples of the aerosol produced were collected and assayed for their 35 sulfur and 22 Na content using liquid scintillation counting. The 35S/22Na enrichment for each droplet sample was dependent upon the combination of the factor levels being bubbled. Both positive and negative enrichments were found. (Author abstract modified)

57288 **APTIC NO. 81613**

Nash, T.

ABSORPTION OF SULPHUR DIOXIDE BY AQUEOUS SOLUTIONS. *Atmos. Environ., 9(12):1129-1130, 1975. 3 refs.*

The effect of hydrogen peroxide addition on the sulfur dioxide absorption efficiency of aqueous solutions of varying pH s was investigated. Sulfur dioxide collection efficiency in water was confirmed to increase as a function of increasing pH values in the absence of hydrogen peroxide. The addition of hydrogen peroxide to aqueous solutions at a given pH resulted in an enhanced SO2 absorption efficiency. About 50% of SO2 gas was collected at a pH of 2.8 in the absence of peroxide, and the same absorption efficiency was achieved at a pH of 1.0 when 0.4 millimole of peroxide was added. (Author abstract modified)

57289 **APTIC NO. 81462**

Rebbert, Richard E. and Pierre J. Ausloos

PHOTODECOMPOSITION OF CFCl3 AND CF2Cl2. *J. Photochem., 4(5-6): 419-434, Nov. 1975. 26 refs.*

The photochemical decomposition of trichlorofluoromethane and dichlorodifluoromethane was investigated, using added methane and ethane as chlorine atom interceptors. The product alkyl radicals combine or disproportionate with other radicals in the system to form products which can be quantitatively analyzed by gas chromatography. The quantum yields of the primary photofragments CFCl2, CF2Cl, CFCl, CF2, CF, and Cl, were derived from the quantum yields of the stable products formed at 213.9, 184.9, 163.3, and 147 nm. This region ecompasses the band of wavelengths which brings about most of the photolysis which occurs in the stratosphere. The photodissociation of both CF2Cl2 and CFCl3 occurred with a quantum yield which is, within experimental error, equal to unity over the entire wavelength region. At long wavelengths close to the absorption threshold, the probability of releasing one chlorine atom/quantum absorbed by either CF2Cl2 or CFCl3 is 0.95 + or - 0.05. As the photon energy is increased at the shorter wavelengths, the probability that two chlorine atoms will be detached increases to about 0.3 + or - 0.1. The CF2 and CFCl radicals produced at these shorter wavelengths are unreactive towards alkanes and halocarbons; these radicals would therefore be expected to react with oxygen in the upper atmosphere. The absorption cross-sections of CF2Cl2 and CFCl3 diminish sharply with a decrease in temperature in the vicinity of the absorption threshold. (Author abstract modified)

57290 **APTIC NO. 81217**

Reber, Ernst

ION EXCHANGE BETWEEN SERPENTINE ASBESTOS AND AQUEOUS ELECTROLYTE SOLUTIONS AS WELL AS CHEMICAL COMPLEXES. *(Ionenaustausch zwischen Serptentinasbesten und waessrigen Elektrolyt-Loesungen sowie Komplexbildnern). Text in German. Staub, Reinhaltung Luft, 35(12):436-440, Dec. 1975. 4 refs.*

The reaction between chrysotile asbestos, chemical complexes, and aqueous solutions of electrolytes were studied, in order to uncover the order and mechanism of the reactions. Similar tests were undertaken with amphibole asbestos. It is probable that such reactions do occur, and that to some extent they reflect the initial reactions of changes that occur in cells.

57291 **APTIC NO. 81069**

Skolnik, Edward G., Stephen W. Veysey, Mahmooda G. Ahmed, and William E. Jones

RATE CONSTANTS FOR THE REACTION OF FLUORINE ATOMS WITH NITRIC OXIDE IN THE PRESENCE OF VARIOUS THIRD BODIES. *Can. J. Chem., 53(21):3188-3193, Nov. 1, 1975. 20 refs.*

The absolute rate constants for the reaction of fluorine atoms with nitric oxide in the presence of argon, helium, neon, nitrogen, nitric oxide, carbon dioxide, carbon tetrafluoride, and hexafluoroethane are reported. The reaction of F2 atoms with NO in the presence of a third body produces nitrosyl fluoride in both ground and excited electronic states. The electronically excited FNO molecules decay to ground state FNO by both radiative and nonradiative processes. In addition to reaction with NO, F2 atoms may be lost by a wall reaction. The values are compared to those found for reactions of chlorine, hydrogen, and oxygen with NO. (Author abstract modified)

57292 **APTIC NO. 81193**

Smirnow, S.

REGRESSION ANALYSIS OF GRAIN SIZE DISTRIBUTIONS WITH THE AID OF THE RRSB FUNCTION AND THE GGS FUNCTION. *(Zur Regressionsanalyse von Korngroessenverteilungen mit der RRSB-Funktion und der GGS-Funktion). Text in German. Aufbereitungs-Technik, 16(6):308-314, 1975. 15 refs.*

A regression analysis is discussed. Test parameters for assessing the quality of approximation between measured values and calculated function values are presented. The formulae for determining by calculation the characteristic figures of uniformity and grain size in the RRSB function as well as in the GGS function are developed. An example of the calculation is given. The logarithmic regression does not give optimum results. Better results are reached by programmable table computers of relatively simple type. The characteristic values which also have to be considered theoretically absolutely correct are attained with the aid of the twofold non-linear Newton iteration process on the basis of the original functions. But for practical applications the simplified methods described normally suffice.

57293 **APTIC NO. 81122**

Smith, Roland, R. G. De Pena, and Julian Heicklen

KINETICS OF PARTICLE GROWTH. VI. SULFURIC ACID AEROSOL FROM THE PHOTOOXIDATION OF SO2 IN MOIST O2-N2 MIXTURES. *J. Colloid Interface Sci., 53(2):203-213, Nov. 1975. 18 refs.*

The kinetics of sulfuric acid aerosol growth from the photooxidation of sulfur dioxide in moist oxygen-nitrogen mixtures was investigated. The particle number density of the H2SO4 aerosol product was monitored as a function of irradiation time. After a 1-minute induction period, particles were produced and increased to a maximum value of about 0.6 times 10 to the 5th power particles/cu cm at about 10 min irradiation time for an SO2 photoremoval constant of 3 times 10 to the minus 6th power/min. The results were independent of the SO2 pressure or the water pressure, but the maximum value was considerably smaller at reduced light intensity. The critical concentration of H2SO4 vapor needed to initiate particle growth was about 10 to the 9th power molecules/cu m. (Author abstract modified)

57294 **APTIC NO. 81633**

Solymosi, Frigyes and Janos Kiss

ADSORPTION AND REDUCTION OF NITROGEN MONOXIDE ON TIN(IV) OXIDE CATALYST. *(A nitrogen-monoxid adszorpcioja es katalitikus redukcioja ondioxid-katalizatoron). Text in Hungarian. Magy. Kem. Folyoirat, 81(10):450-457, Oct. 1975. 17 refs.*

The rates of the chemisorption of nitrogen monoxide were measured on different samples of tin dioxide in the 25 to 150 C temperature range. Kinetic measurements revealed that the extent and the rate of NO adsorption on oxidized SnO2 was less than on activated SnO2, which was less than on reduced SnO2. Preadsorbed NO promoted the adsorption of carbon monoxide, which is attributed to the formation of a surface isocynate complex. Electric conductivity measurements during the NO adsorption have shown that negatively and positively adsorbed species are both present on the activated surface.

The catalytic reduction of NO with CO on SnO2 proceeded with reproducible rates only above 360 C. The reaction was of zero order with respect to CO and first order with respect to NO. The activation energy was 36.6 kcal/mole. The catalytic reaction took place on the weakly reduced surface. The reduced centers may play an important role in the activation of NO, and the NO may undergo dissociation during adsorption. A possible mechanism of the catalytic reduction of NO is discussed. (Author abstract)

57295 **APTIC NO. 81679**

Takagi, Maki, Tomoji Kawai, Takaharu Oonishi, and Kenji Tamaru

NOX REDUCTION REACTION MECHANISM BY NH3 IN V2O5 CATALYST SYSTEM. *(V2O5 kei shokubai ni okeru NOx no NH3 ni yoru kangen hanno kiko). Text in Japanese. Preprint, Japan Society of Catalysis, Tokyo, p. 110-111, 1975. (Presented at the Japan Society of Catalysis, Lecture Meeting, 37th, Fukuoka, Oct. 19-20, 1975, Paper 3G15.)*

Reduction of nitrogen oxides by ammonia on vanadium pentoxide and V2O5 alumina catalysts were studied at temperatures ranging from 25 C upwards. On V2O5 catalyst, the following mechanisms were deduced for the reduction of nitric oxide by NH3 in the presence of oxygen. Oxygen oxidizes NO to nitrogen dioxide, which is adsorbed on V2O5 as NO2(ad). Oxygen also promotes the adsorption of NH3 as NH4(1+)(ad) on the catalyst. The reaction of NO2(ad) and NH4(1+)(ad) results in formation of nitrogen and water. The formation of nitrous oxide from NO did not occur, even in the presence of already-reduced V2O5.

57296 **APTIC NO. 81292**

Takayasu, Masami, Hiromi Tomono, Yoshiaki Annen, and Yoshiro Morita

CATALYTIC REDUCTION OF NITRIC OXIDE WITH HYDROGEN OR METHANE. *Bull. Sci. Eng. Res. Lab. (Tokyo), no. 68:25-31, 1975. 4 refs.*

The catalytic reduction of nitric oxide with hydrogen or methane was investigated in the presence of metallic oxide or noble metal catalysts. Among them, copper, nickel, platinum, and palladium alumina catalysts had high activity. In the reduction of NO with H2, the selectivity for NH3 formation increased with a decrease of NO concentration. It was not influenced by the concentration of H2. Hydrogen was consumed, while produced NH3 was oxidized by the addition of oxygen. When 0.3 vol% oxygen was present in the NO (1000 ppm)-H2 (2.0 vol%) reaction system over Cu-alumina catalysts, at 350 C, only Cu crystallites were detected, while at 150 C, copper oxide crystallites as well as Cu were detected. In the reduction of NO with CH4, deactivation by carbon deposit was detected. Hydrogen was better than CH4 as a reducing gas. (Author abstract modified)

57297 **APTIC NO. 78939**

Ugo, R.

THE CONTRIBUTION OF ORGANOMETALLIC CHEMISTRY AND HOMOGENEOUS CATALYSIS TO THE UNDERSTANDING OF SURFACE REACTIONS. *Catal. Rev. Sci. Eng., 11(2):225-297, 1975. 202 refs.*

Studies on the contribution of organometallic chemistry and homogeneous catalysis to the understanding of surface reactions are reviewed. Emphasis is placed on chemisorption processes for hydrogen, carbon monoxide, nitrogen oxides, hydrocarbons, saturated hydrides, alkyl halides, dinitrogen, and dioxygen; the characterization of reactive intermediates including models for hydrocarbon intermediates, models for hydrocarbon surface reactions, and new approaches to surface hydrocarbons; mobility of surface species; origin of the reactivity of surface species; and the mechanisms of surface reactions.

57298 **APTIC NO. 81036**

Weaver, James, James Meagher, Robert Shortridge, and Julian Heicklen

THE OXIDATION OF ACETYL RADICALS. *J. Photochem., 4(5/6):341-360, Nov. 1975. 26 refs.*

The oxidation of acetyl radicals at 25 C was studied by photolyzing azomethane in the presence of acetaldehyde and oxygen. The quantum yields of methanol, carbon dioxide, dimethylperoxide, and peracetic acid were obtained for the four isotopic combinations of CH3N2CH3 or CD3N2CD3 with CH3CHO or CD3CDO. (Author summary modified)

57299 **APTIC NO. 81358**

Wendt, J. O. L. and J. M. Ekmann

EFFECT ON FUEL SULFUR SPECIES ON NITROGEN OXIDE EMISSIONS FROM PREMIXED FLAMES. *Combustion Flame, 25(3):355-360, Dec. 1975. 15 refs.*

The effect of some fuel sulfur compounds on nitrogen oxides emissions arising from thermal fixation was investigated using a methane air flat flame doped with either sulfur dioxide or hydrogen sulfide. Fuel sulfur inhibited the formation of NOx significantly in all air/fuel ratios and especially at high air preheats. The presence of sulfur sufficient to make about 68,000 ppm SO2 in the exhaust lowered NOx emissions by up to 36%. These results were valid for premixed gaseous flames and imply that fuel desulfurization leads to increased (thermal) NOx emissions. (Author abstract modified)

57300 **APTIC NO. 81051**

Yang, Ralph T. and Meyer Steinberg

FUNCTION OF SULFUR DIOXIDE IN THE KINETIC MECHANISM OF OXIDATION OF CARBON. *Carbon, 13(5):411-416, 1975. 31 refs.*

The function of sulfur dioxide in the kinetic mechanism of oxidation of carbon was investigated. Rates of oxidation were determined by thermal gravimetric analysis (TGA) of a nuclear graphite in the temperature range of 550-700 C and of a coconut charcoal in the temperature range of 400-505 C. The oxidation gases were dry air containing 0-6% sulfur dioxide. Reduction of the rate by SO2 varied with burn-off. Differential thermal analysis (DTA) was applied to detect the retardation effect of SO2. The technique of infrared internal reflection spectroscopy (IRS) was used to examine the surface species of reacted charcoal samples. Absorption bands were assigned to surface carbonyls, lactones, and a chemisorbed SO2 in the form of sulfate. Chemisorption of SO2 caused the retardation of the oxidation reaction. (Author abstract modified)

57301 **APTIC NO. 81140**

Yip, Kwok L. and Donald R. Francheschetti

SEMI-EMPIRICAL POTENTIAL ENERGY SURFACE FOR THE BINDING OF CARBON MONOXIDE TO FERROUS PORPHIN. *Chem. Phys. Letters (Amsterdam), 36(5):580-582, Dec. 15, 1975. 7 refs.*

The binding of ferrous porphin and carbon monoxide was studied theoretically. Potential energy surfaces were obtained in an extended Huckel calculation for the lowest 1A1 and 5B2 states. The relevance of these surfaces to experimental kinetic data is discussed. (Author abstract modified)

1974

57302 **APTIC NO. 81323**

Atkinson, R. and J. N. Pitts, Jr.

ABSOLUTE RATE CONSTANTS FOR THE REACTION OF O(3P) ATOMS WITH SELECTED ALKANES, ALKENES, AND AROMATICS AS DETERMINED BY A MODULATION TECHNIQUE. *J. Phys. Chem., 78(18):1780-1784, 1974. 37 refs.*

The absolute values of the room temperature rate constants for the reaction of oxygen(3P) atoms with ethylene, propylene, n-butane, and a series of aromatic hydrocarbons have been determined using a modulation phase shift technique. The rate consists for ethylene, propylene, and n-butane were determined in order to test the experimental system over a wide range of hydrocarbon reactivities and with a view to resolving minor discrepancies in the literature for ethylene and n-butane. The rate constant for the reaction O + nitric oxide + M (M equals nitrous oxide) was determined, this reaction being the basis for monitoring O(3P). The rate constants (k2 times 10 to the minus 8th power/mole/sec) obtained are ethylene (4.00 + or - 0.40), propylene (20.1 + or - 2.2), n-butane (0.188 + or - 0.02). benzene (0.144 + or - 0.02), toluene (0.45 + or - 0.045), o-xylene (1.05 + or - 0.11), m-xylene (2.12 + or - 0.21), p-xylene (1.09 + or - 0.11), 1,2,3 trimethylbenzene (6.9 + or - 0.7), 1,2,4 trimethylbenzene (6.0 + or - 0.6), 1,3,5 trimethylbenzene (16.8 + or - 2.0). The rate constant for the reaction O+NO+M (M equals N2O) was 4.3 + or - 0.43 times 10 to the 10th power/sq mole/sec, in agreement with literature values. (Author abstract modified)

57303 **APTIC NO. 81328**

Atkinson, R. and J. N. Pitts, Jr.

TEMPERATURE DEPENDENCE OF THE REACTION RATE CONSTANTS FOR O(3P) ATOMS WITH C2H4, C3H6 AND NO(M EQUALS N2O), DETERMINED BY A MODULATION TECHNIQUE. *Chem. Phys. Letters (Amsterdam), 27(4):467-470, Aug. 15, 1974. 23 refs.*

A modulation-phase shift technique was used to determine the temperature dependencies of the rate constants for the reaction of oxygen (3P) atoms with ethylene (C2H4) and propylene (C3H6) over the range 300 to 392 K. The temperature dependence of the rate constant for the reaction oxygen + nitric oxide +M (M equals nitrous oxide) was also measured, this reaction being the basis for monitoring O(3P) atoms. The Arrhenius expressions obtained are given. These temperature dependencies of the rate constants are in good agreement with recent flash photolysis-resonance fluorescence measurements, although lower than previous literature values. (Author abstract modified)

57304 **APTIC NO. 81400**

Atkinson, R. and J. N. Pitts, Jr.

RATE CONSTANTS FOR THE REACTION OF O(3P) ATOMS WITH SO2(M EQUALS N2O) OVER THE TEMPERATURE RANGE 299-392 K. *Chem. Phys. Letters (Amsterdam), 29(1):28-30, Nov. 1, 1974. 16 refs.*

Third order rate constants have been determined for the reaction in which oxygen + sulfur dioxide + nitrous oxide form sulfur trioxide and nitrous oxide over the temperature range 299 to 392 K using a modulation technique. Total pressures varied from 54 to 135 torr. The Arrhenius expression obtained is given. This temperature dependence is in good agreement with recent flash photolysis-resonance fluorescence measurements using nitrogen as a third body. (Author abstract modified)

57305 **APTIC NO. 71532**

Baumgarten, G. P. and F. W. Ruegg

BUILDING AND EVALUATION OF A POLLUTED AIR DELIVERY SYSTEM. *National Bureau of Standards, Washington, D. C., Fluid Meters Section, Environmental Protection Agency Contract, Rept. NBSIR 73- 414, 36p., April 1974.*

NTIS: COM-74-10866

A prototype sulfur dioxide polluted air delivery system is described. The system is designed to deliver SO2 in air at a rate of 5 l/min with concentration (by volume) of 1.0, 0.1, and 0.01 ppm SO2. The apparatus consists of a diluent air delivery system that utilizes a critical flow sonic nozzle and three separate concentrated SO2-in-air flow systems with laminar flow porous plugs (one plug for each desired output concentration). The delivery system is contained in a dispatch case, and the two gases are delivered to it from pressurized containers through detachable supply lines. By maintaining specific upstream pressures on the critical flow nozzle and the laminar flow porous plugs at 45 and 12 psig, respectively, the prototype system produces average output concentrations of 0.76, 0.100, and 0.003 ppm SO2 in air. The uncertainty of the output concentration is estimated to be about + or - 10%. (Author abstract modified)

57306 **APTIC NO. 81111**

Demerjian, Kenneth L., Jack G. Calvert, and David L. Thorsell

A KINETIC STUDY OF THE CHEMISTRY OF THE SO2 (3B1) REACTIONS WITH CIS- AND TRANS-2-BUTENE. *Inter. J. Chem. Kinet., vol. 6:829-848, 1974. 49 refs.*

The chemical reactions of sulfur dioxide (3B1) molecules with cis 2 butene and trans 2 butene were studied in gaseous mixtures at 25 C by excitation of SO2 using 3500 to 4100 angstrom light. The initial quantum yields of olefin isomerization were determined as a function of the (SO2):(2 butene) ratio and added gases, helium and oxygen. The kinetic treatment of these data suggests that some common intermediate is formed in the SO2(3B1) quenching step with either cis or trans 2 butene. It decomposed very rapidly to form the 2 butene isomers in the ratio (trans 2 butene):(cis 2 butene) equal to 1.8. Sulfur dioxide was excited using a 3630 + or - 1 A laser pulse of short duration, and the SO2(3B1) quenching rate constants with the 2 butenes were determined from the SO2(3B1) lifetime measurements. The rate constants at 21 C were (1.29 + or - 0.18) times 10 to the 11th power and (1.22 + or - 0.15) times 10 to the 11th power l/mole sec with cis 2 butene and trans 2 butene, respectively, as the quencher molecule. These quenching constants, within experimental error, equal those derived from the quantum yield data. Thus the rate determining step in the isomerization reaction is suggested to be the quenching reaction, presumably the formation of the triplet SO2-2-butene addition complex. Aerosol growth was monitored using light scattering measurements. The aerosol formation probably originated largely from sulfur trioxide and sulfuric acid mist formed following the reaction in which SO2(3B1)+SO2 formed SO3+S(3sigma-). Aerosol formation from photochemically excited sulfur dioxide olefin interaction was probably unimportant in these systems and must be unimportant in the atmosphere. (Author abstract modified)

57307 **APTIC NO. 81326**

Finlayson, B. J., J. N. Pitts, Jr., and R. Atkinson

LOW-PRESSURE GAS-PHASE OZONE-OLEFIN REACTIONS. CHEMILUMINESCENCE, KINETICS, AND MECHANISMS. *J. Am. Chem. Soc., 96(17):5356-5367, Aug. 21, 1974. 81 refs.*

Chemiluminescence from electronically excited formaldehyde (HCHO(1Adouble prime) going to 1A1), hydroxyl (X superscript 2 pi subscript i) subscript v prime not greater than 9, and hydroxyl (A superscript 2 sigma superscript +) has been observed in the gas phase reaction of 2% ozone in oxygen, nitrogen, or helium with a series of simple olefins in a flow system at room temperature and at total pressures of 2 to 10 torr. The vibration rotation emission from the second substance was virtually identical with hydroxyl Meinel band emission from hydrogen + O3 forming hydroxyl (superscript 2 pi subscript i) subscript v prime not greater than 9 + O2, confirming that H atoms are formed in O3-olefin reactions. Glyoxal phosphorescence was identified in the presence of O2 in the 2 butene (cis or trans) reaction; methylglyoxal phosphorescence was tentatively identified from the reactions of isobutene, 2 methyl 2 butene, and 2,3 dimethyl 2 butene with ozone. The number of quanta emitted/molecule of reactant consumed at 4.6 torr total pressure in the ethylene and cis 2 butene reactions was estimated at 10 to the -7th power for the excited formaldehyde reaction and 10 to the -5th power quanta for glyoxal (superscript 3A subscript u going to superscript 1 A subscript g) in the cis 2 butene reaction. Approximately 10 to the -7th power quanta were emitted in the (9,3) transition of vibrationally excited OH/molecule of reactant consumed, indicating that the formation of vibrationally excited OH is a surprisingly efficient process udner these conditions. The time decay of light emission from each excited species in the ethylene, cis 2 butene, and isobutene reactions was exponential on O2 but nonexponential in N2 or He, with increased emission intensities occurring at reaction times less than 0.1 sec in the latter case. Rate constants, determined from the loss of O3 in both O2 and N2 as diluents, assuming 1:1 stoichimetry, were 2 to 5 times greater in N2. The measured rate constants in 10 torr O2 for the ethylene, cis 2 butene, and isobutene reactions respectively were 1 + or - 1 times 1000, 6.3 + or - 1.9 times 10,000, and 5.4 + or - 2.3 times 1000 l/mole/sec. Major products of the reaction of cis 2 butene with ozone in either O2 or N2 as the carrier gas were, in addition to acetaldehyde; 2 butanone, possibly from the hydroxyl cis 2 butene reaction; and methyl vinyl ketone which was observed only in oxygen. The results are discussed in terms of the O Neal-Blumstein theory of gas phase ozone-olefin reactions. The possible role of these reactions in photochemical smog formation is considered. (Author abstract)

57308 **APTIC NO. 81310**

Hunziker, H. E. and H. R. Wendt

NEAR INFRARED ABSORPTION SPECTRUM OF HO2. *J. Chem, Phys , 60(11):4622-4623, June 1, 1974. 21 refs. (Presented at the International Conference of Photochemistry, 7th, Jerusalem, Israel, Aug. 1973 and at the International Symposium on Free Radicals, 11th Berchtesgaden-Koenigsee, Germany, Sept. 1973.)*

The near infrared absorption spectrum of the hydroperoxyl radical was studied in the gas phase from 0.5-2.2 micron using a modulation kinetic spectroscopy technique for mercury-photosensitized reactions. The mercury-photosensitized decomposition of hydrogen (750 torr) was used to generate hydroperoxyl or deuteroperoxyl radicals. A search of the near infrared region revealed three bands, each in hydrogen and deuterium. Observed bands in the HO2 spectrum were at 1.504 + or - 0.001 micron, 1.425 + or - 0.002 micron, and 1.255 + or - 0.002 micron. Those for the DO2 spectrum were at 2.022 + or - 0.003 micron, 1.425 + or - 0.002 micron, and 1.254 + or - 0.002 micron. The new bands occur in atmospheric absorption windows and can conceivably be used to monitor HO2 concentration.

57309 **APTIC NO. 81264**

Karavaev, M. M. and V. G. Visloguzova

ABSORPTION OF NITROGEN DIOXIDE BY NITRIC ACID OF HIGH CONCENTRATION. *J. Appl. Chem USSR (English translation from Russian of: Zh. Prikl. Khim (Leningrad)), 47(5):1001-1005, Oct. 15, 1974. 9 refs.*

The physical absorption of nitrogen dioxide by a 70% solution of nitric acid was investigated. The reaction rate was determined by diffusion of the NO2 through the gas-liquid film; this followed from the fact that the absorption rate fell with an increase in the contact time. The absorption rate coefficient and the degree of absorption increased with a decrease in the temperature and an increase in the liquid rate and acid concentration. Decreases in the absorption rate coefficient and degree of absorption occurred with increasing NO2 partial pressure.

57310 **APTIC NO. 74455**

Kato, K., C. Kurata, K. Mori, and K. Fujii

GENERATION OF AND HOW TO REDUCE FUEL NO. *(Fuel NO no seisei to sono teigenho ni tsuite). Text in Japanese. Preprint, Japan Combustion Assoc., Tokyo, 4p., 1974. 4 refs. (Presented at the Japan, Combustion, Association Symposium, 12th, Tokyo, Japan, Dec. 5-6, 1974.)*

Nitrogen oxide generation in a diffusion flame was studied, using various fuels. Cases where fuel nitrogen is present and absent were also studied. Nitric oxide and oxygen inside the burner were studied to examine the generation process of fuel NO in a diffusion flame. Seven fuels, including hydrogen, carbon monoxide, methane, and mixtures of these were selected. Diffusion flames containing CH4 had a greater conversion rate of ammonia to NO compared with CO or H2 flames. Fuel nitrogen (NH3) decomposed NO in the inner area of the flame belt of H2 flames with a low O2 concentration. The conversion ratio was small in diffusion flames because the fuel N decomposed in the inside area of the flame belt. Hydrogen cyanide was generated in the inside area of the flame belt of HC diffusion flames. Nitric oxide that was added to fuel decomposed greatly in the flame belt area, as in the case of fuel N. Carbon monoxide which generated much fuel NO in premixed flames did not generate it much in layer diffusion flames.

57311 **APTIC NO. 81715**

Ogasawara, Mitsunobu, Toshimi Takagi, Kenichi Fujii, and Masahito Daizo

CHARACTERISTICS OF NITRIC OXIDE (NO) FORMATION IN TURBULENT DIFFUSION FLAMES. *(Ranryu kakusan kaen ni okeru NO seisan tokusei). Text in Japanese. Nippon Jidosha Kenkyujo Kenkyu Sokuho (Res. Lett. Japan Automob. Inst.), no. 30:167-179, Sept. 1974. 2 refs.*

Gaseous fuel was injected into a Pyrex combustion tube, along the same axis as the air supply. The characteristics of nitric oxide formation in typical turbulent diffusion flames around the jet flow were studied. Five fuel-air mixtures were studied: hydrogen/air, hydrogen/air/nitrogen 10% (fuel flow rate, 340 cc/sec; inlet air temperature 25 C; average air ratio (air in excess of the theoretical amount), 2.5); propane/air, C3H8/air/N2 10% (fuel flow rate, 90 cc/sec; inlet air temperature, 25 C; average air ratio, 1.2); C3H8/air (inlet air temperature, 250 C; fuel flow rate, 90 cc/sec; average air ratio, 1.2). Representative temperatures of NO formation for H2/air (67 ppm/ms) and H2/air/N2 10% (28 ppm/ms) ranged from 2100- 2300 K. Representative temperatures for C3H8/air (8.4 ppm/ms), C3H8/air/N2 10% (8.1 ppm/ms), and C3H8/air (air temperature 250 C; 18 ppm/ms), ranged from 1600-2000 K. The formation of NO was greatly decreased when the temperature of H2 flames was lowered. Such an effect was negligible for propane (C3H8) flames, especially at the lower NO formation temperatures. The rate of NO formation could not be predicted from the Zeldovich mechanism, under the assumption that oxygen atom concentration was at an equilibrium. With a decrease in the average air ratio, NO emission was reduced. With an increase in excess air, NO emissions were reduced, but total amounts of NO emitted exceeded theoretically calculated values. When N2 is locally mixed into localized high temperature regions, NO formation is effectively reduced. The nozzle diameter, degree of premixing, and amounts burned interact and influence NO emissions.

57312 **APTIC NO. 74734**

Ono, Hidetsugu and Takeshi Saito

STUDIES ON THE NITROGEN OXIDE EMISSION FROM A PREMIXED CONSTANT VOLUME COMBUSTION (REPORT NO. 1). *(Yokingo teiyo nensho ni okeru NOx hassei ni kansuru kenkyu). Text in Japanese. Preprint, Japan Society of Automotive Engineers, p. 327-332, 1974. 6 refs. (Presented at the Japan Society of Automotive Engineers Lecture Meeting, Tokyo, Japan, Oct. 15-17, 1974, Paper 44.)*

Nitrogen oxide formation during premixed, constant volume combustion was studied along with the suitability of the Zeldovich mechanism for predicting the reaction kinetics. A methane-air mixture was introduced into a stainless steel cylinder, and the gas was ignited with an ignition plug at one end of the cylinder. Combustion gases were sampled at given time from an electromagnetic valve equipped on the side wall of the cylinder (65 mm from the ignition plug). Nitrogen oxide concentration was determined by a chemiluminescence method. The average sample amount was 15 ml, which was diluted 10 times. The rate of nitric oxide formation reached a maximum at an excess air ratio of 1.05. Prompt NO formation occurred in the flame, and its effect on the fixed NO concentration was particularly significant at a low excess air ratio. The Zeldovich mechanism was suitable for the kinetics analysis when the formation of NOx in the flame was considered at an excess air ratio below unity and when the elementary process of the formation of nitric oxide from oxygen and nitrogen was considered at a high excess air ratio of about 1.4.

57313 **APTIC NO. 76977**

Otake, Kazutomo, Yasuo Mori, and Tatsuji Taira

A STUDY OF THE FORMATION AND BEHAVIOR OF NITROGEN OXIDES IN COMBUSTION REACTIONS (REPORT NO. 2: THEORETICAL CALCULATIONS ON 2-DIMENSIONAL LAMINAR FLOW ACCORDING TO CHEMICAL KINETICS). *(Nensho hanno ni tomonau NO no shosei to kyodo ni kansuru kankyu (Dai-2-ho: Hanno sokudoron ni yoru 2-jigen soryu riron keisan)). Text in Japanese. Preprint, Japan Society, of Mechanical Engineers, Osaka, p. 159-174, 1974. 13 refs. (Presented at the Japan Society of Mechanical Engineers. National Meeting, 52nd, Osaka, Japan, Nov. 3-5, 1974, Paper 1516.)*

A two-dimensional analysis with respect to nitric oxide and combustion gas components was carried out in the axial direction, taking convection, diffusion, and chemical dynamics into consideration. The wake of the flame was one-dimensional, but the section of the gas flow perpendicular to the wake had temperature and concentration distributions in the radial and axial directions. In order to investigate the formation and behavior of NO in the wake of the flame region, eight chemical reactions were considered, and the concentration distributions of oxygen, hydroxide, hydrogen, hydrogen gas, carbon monoxide, and oxygen gas were calculated by means of chemical dynamics. The expanded Zeldovich mechanism was used to find the N concentration, assuming a quasi-stationary approximation for N. A two-demensional conservation equation in the axial direction with respect to NO was developed and a new, less time-consuming method of calculation was developed for finding the NO distribution. The three-body recombination reaction of O, OH, and H played an important role in the behavior of NO. By choosing the appropriate reaction rate constants, the observed values of NO were satisfactorily explained. The two-dimensional analysis clarified behavior which could not be calculated from one-dimensional theory, and resulted in good agreement between observed and calculated values. (Author summary modified)

57314 **APTIC NO. 78541**

Rao, K. Naharahi

ASPECTS OF LABORATORY STUDIES IN HIGH-RESOLUTION INFRARED SPECTROSCOPY. *Dept. of Transportation, Washington, D. C., Climat. Impact Assess. Conf., 3rd, Cambridge, Mass., 1974, p. 173-183, 48 refs. (Feb. 26-March 1.)*

NTIS, DDC: AD A003846

Developments in spectra resolution, precision in spectral positions, and intensity measurements of spectral lines in the infrared are discussed. The carbon monoxide spectrum and solar CO data are discussed in greater detail. Some sample data are presented for work still in progress on the spectra of carbon dioxide, water vapor, nitrous oxide, and nitric oxide in the region of about 5.3 micron in the infrared. Some aspects of the infrared bands of nitrogen dioxide are mentioned. (Author abstract modified)

57315 **APTIC NO. 77863**

Sanhueza, Engenio and Julian Heicklen

THE REACTION OF O(3P) WITH C2CL4. *Pennsylvania State Univ., University Park, Center for Air Environment Studies, Rept. 305-73, 29p., Feb. 1974. 9 refs.*

The oxidation of tetrachloroethene by oxygen atoms obtained from mercury photosensitization of nitrous oxide was studied at 25 C, and the results were compared with those obtained by chlorine- atom initiation and ozonolysis to determine whether a monoradical or diradical mechanism was involved. A reaction mechanism was postulated which involved the formation of an energetic intermediate which polymerized. The kinetics of the reaction were also studied, and an expression to which the chain length is proportional was derived. The reaction was run in the presence and absence of molecular oxygen and also with and without the addition of nitric oxide or sulfur dioxide. In the absence of O2, the addition of NO or SO2 did not affect the reaction much; however, in the presence of O2, the chain length of oxidation was reduced, indicating that both species can react with one or more of the radical intermediates.

57316 **APTIC NO. 76647**

Taniguchi, H., M. Mauyama, and Y. Hayasaka

ON GENERATION OF NOX IN STATIONARY BURNING FLAME (2), ON BEHAVIOR OF NOX IN FLAME AND FUEL GAS. *(Teijo ensho kaen chuno NOx no hassei ni tsuite (2), Kaenchu oyobi nenshogasuchu no NOx no kyodo ni tsuite). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Tokyo, p. 21-24, 1974. 2 refs. (Presented at the Japan Society of Mechanical Engineers Hokkaido Branch Lecture Meeting, 17th, Hokkaido, Japan, Oct. 2, 1974.)*

Even in the case of the same furnace charge and excess air coefficient, different nitrogen oxides concentrations are generated by different furnaces; this difference may be dependent on the formation and decomposition processes of NOx in burning flames. Measurements were made of temperature distribution in flame and fuel gas and the concentration distribution of NOx in order to examine these processes. The apparatus and experimental conditions used were: horizontal cylinder (diameter 300 mm, length 1200 mm); propane fuel (1.66 kg/hr); air excess coefficient of 1.48; and air nozzles (A, 105 mm diameter; B, 85 mm diameter; C, 60 m diameter).

57317 **APTIC NO. 81289**

Vigler, M. S. and V. F. Gaylor

TRACE METALS ANALYSIS IN PETROLEUM PRODUCTS BY ATOMIC ABSORPTION. *Appl. Spectry., 28(4):342-344, July-Aug. 1974. 9 refs.*

An atomic absorption method for the analysis of aluminum, antimony, barium, beryllium, bismuth, calcium, cadmium, cobalt, chromium, copper, iron, potassium, lead, magnesium, manganese, molybdenum, nickel, sodium, silicon, tin, titanium, vanadium, and zinc contained in petroleum products (oil, kerosene, coke, coal) at levels ranging from 1 ppb to 5 ppm is described. An appropriate amount of the sample is ashed by absorbing liquid samples on magnesium sulfonate ash aid (Conostan, Conoash M) or potassium sulfonate. Subsequently, five drops of sulfuric acid are added; and the mixture is heated to white fumes, fired, and ashed to 650 C. The sulfonated ash is dissolved in dilute acid to provide the aspiration solution. Recovery studies on aluminum, antimony, beryllium, cadmium, and lead in the microgram per gram range are presented.

57318 **APTIC NO. 81291**

Wilson, J. S. and M. W. Redifer

EQUILIBRIUM COMPOSITION OF SIMULATED COAL COMBUSTION PRODUCTS: RELATIONSHIP TO FIRESIDE CORROSION AND ASH FOULING. *J. Eng. Power, 1974:145-152, April 1974. 13 refs. (Presented at the*

American Society of Mechanical Engineers, Winter Annual Meeting, Detroit, Mich., Nov. 11-15, 1973, Paper 73-WA/CD-6.)

A computer simulation of the chemical equilibrium composition resulting from high-temperature combustion reactions is related to fireside corrosion and ash fouling in pulverized coal-fired boilers. A mathematical expression which models the injection of a sodium-potassium mixture through a flame is solved for equilibrium compositions at a pressure of 1 atmosphere, temperatures of 1500-3000 F, and oxygen levels ranging from 0.1% to 17%. Alkali sulfates and hydroxides are the principal products produced at equilibrium in a model of a combustion product atmosphere resembling that in a coal-fired boiler. A total of 42 reactions involving 40 chemical species are treated in the reactant mixture, and compositions for the entire system are included. (Author abstract modified)

57319 **APTIC NO. 81566**

Yoshida, Matsatake, Toshio Takishita, Nobuo Iwai, and Shinji Kobayashi

TIME RESOLVED LOCAL GAS COMPOSITION IN A COMBUSTION CHAMBER OF SPARK IGNITION ENGINE. *(Hibana tenka kikan no nenshoshitsu kakubu ni okeru nensho, bocho katei no gasu sosei). Text in Japanese. Nippon Jidosha Kenkyusho Kenkyo Sokuho) Res. Lett. Japan Automob. Inst.), no. 24:1-49, Aug. 1974.*

A study of the formation mechanism of nitric oxide in a combustion chamber and the experimental verification of theoretical calculation values were undertaken by measuring the variation in concentrations of NO and other stable components (oxygen, carbon dioxide, carbon monoxide, hydrogen and nitrogen) with time and space, employing gas sampling at wide crank angle positions of the piston in the combustion chamber. The NO concentration was determined by chromatograph-mass spectrometer, while other components were measured by gas chromatography. The formation mechanism of NO in a combustion chamber was investigated by measuring flame propagation using ion plugs, and a difference in NO formation process dependent on location in the combustion chamber was confirmed. The NO concentration correction for the oxidation of NO by O2, the calculation of sampled gas volume, the measurement of the molecular weight of gasoline by freezing point depression, the concentration correction regarding vapor condensation, the measurement method for the chemical formula of fuel, the estimation of residual gas ratios and fuel concentrations, the estimation of mixing ratios based on the gas composition after combustion, and factors that interfere with NO concentration measurements are also reviewed.

1973

57320 **APTIC NO. 73462**

Gauss, Arthur

FUEL AND HYDROCARBON VAPORIZATION. *Ballistic Research Labs., Aberdeen Proving Ground, Md., Terminal Ballistics Lab., RDT and E Proj. 1T061102A33E, Rept. 1661, 65p., Aug. 1973. 16 refs.*

NTIS, DDC: AD 769709

A semi-empirical expression is developed to predict the evaporation rates of pure liquid hydrocarbons under a wide range of conditions. An expression for the mass evaporation rate of a mixture of two liquids is also formulated, and the results can be extended to real fuels by finding the appropriate binary mixture which approximates the fuel. Evaporation measurements of hydrocarbon pools with a thermogravimetric analyzer indicate that even very slow air movement (a few cm/sec) significantly affects the vaporization rate and flammable envelope of such pools. The mass evaporation rate expression developed appears to effectively model evaporation into slow moving air where the velocity distribution is reproducible over the period of the evaporation rate measurements. (Author abstract modified)

57321 **APTIC NO. 81580**

Griffin, O. M. and C. W. Votaw

THE USE OF AEROSOLS FOR THE VISUALIZATION OF FLOW PHENOMENA. *Intern. J. Heat Mass Transfer, vol. 16:217-219, 1973. 11 refs.*

A method for visualizing flow phenomena that utilizes a polydisperse liquid aerosol of di(2-ethylhexyl)-phthalate which is generated at room temperature in a system with no moving parts is described. The generated aerosol is particularly useful for the visualization of oscillatory and turbulent flows and can be used to provide information on ventilating systems and filters. Compressed air from a laboratory supply outlet is passed through a pressure control valve and gage so that the entrance flow into a vertical inlet pipe and atomizer nozzles can be metered. The compressed air is fed through the atomizer nozzles to produce a high velocity air stream through four holes which lie at least 25 mm below the surface of the DOP liquid in the nozzle head. The exiting streams of air atomize the nearby liquid by means of high shearing action and produce an aerosol of small particles. The supply of liquid DOP into the high shear region is maintained by vertical feed holes in a collar mounted on the body of the nozzle pipe. The atomized particles of DOP are then passed through a tubing system to a jet impactor that is designed to reduce the size range of dispersed particles in the aerosol. The aerosol is fed into a flexible pipe or tube and is ready for introduction into a wind tunnel or experimental apparatus. The particles produced are of known size and flow rate. The system is continuously operable and controllable for several hours duration, with the only requirement being a filtered and regulated supply of compressed air.

57322 **APTIC NO. 81308**

Hoppel, W. A. and J. E. Dinger

PRODUCTION OF CLOUD NUCLEI BY ULTRAVIOLET RADIATION. *J. Atmospheric Sci., 30(2):331-334, March 1973. 8 refs.*

The production of cloud condensation nuclei by the ultraviolet radiation of filtered air samples was investigated on the ground and during aircraft flights. The cloud condensation nuclei were measured with a thermal gradient diffusion cloud chamber operating at a supersaturation of 0.7%. Condensation nuclei (Aitken type) appeared almost immediately after the irradiations were begun, but the cloud condensation nuclei did not appear until about a half hour later. The time at which the cloud condensation first appeared was a function of the supersaturation in the thermal gradient diffusion cloud chamber. At lower supersaturations their appearance was delayed, while for higher supersaturations the cloud condensation nuclei appeared sooner than expected. The most obvious explanation for the data was that the very small Aitken nuclei which were formed immediately after irradiation took considerable time to grow by vapor diffusion of the reacted molecules and by coagulation to a size large enough to become active as cloud condensation nuclei at a supersaturation of 0.7%. No effect was made to identify the reactions or the trace gases which were responsible for the gas-to-particle conversion; however, whatever the impurities were, they appeared to be always present in the atmosphere at least below 15,000 ft and in several geographical locations.

57323 **APTIC NO. 81282**

Koberstein, Edgar

MODEL REACTOR STUDIES OF THE HYDROGEN CYANIDE SYNTHESIS FROM METHANE AND AMMONIA. *Ind. Eng. Chem, Process Design Develop., 12(4):444-448, 1973. 15 refs.*

The macrokinetics and reaction mechanism of hydrogen cyanide synthesis from methane and ammonia were investigated. Measurements of the radial and axial concentration profiles and of the temperature distribution were made in an electrically heated model reactor with reaction tubes of 1500 mm in length. After the reaction was initiated, the reaction rate increased with increasing temperature until mass transfer became rate determining. The main conversion occurred in this transition range between chemically or diffusion-controlled rates in a comparatively short section of the reaction tube. Cooling of the outlet tube via its support led to a large temperature gradient between the wall and gas, and separation of the gas components occurred by thermal diffusion. The shifting of the reaction zone into this section resulted in an abrupt cessation of the reaction.

57324 **APTIC NO. 81054**

Krzhizhanovskii, R. E., V. L. Movsesyan, and I. I. Chudnovskaya

INFLUENCE OF PARTICLE SIZE OF ASH ON THE STRUCTURE AND EFFECTIVE THERMAL CONDUCTIVITY OF LOOSE DEPOSITS. *Thermal Eng. (English translation from Russian of: Teploenergetika), 19(10):36-39, Oct. 1973. 5 refs.*

Structural and thermal characteristics of loose ash deposits typical of convective heating surfaces in boilers within the temperature range from 150 to 800 C were investigated. Ash of Donetsk lean coal, taken from the electrostatic precipitators in a TP-80 boiler, was separated into fractions by control sieves and by a centrifuge. The limiting sizes of the fractions, their average diameter, and the shape of the particles were determined by microphotography. For each fraction at least 2000 particles were measured. The effective thermal conductivity of loose ashes depends in part on the porosity and the percent concentration of fine (up to 10 micron) particles.

57325 **APTIC NO. 81263**

Lunsford, J. H. and D. P. Johnson

ELECTRON PARAMAGNETIC RESONANCE STUDY OF S3 ANION FORMED ON MAGNESIUM OXIDE. *J. Chem. Phys., 58(5):2079-2083, March 1, 1973. 23 refs.*

Sulfur-33 hyperfine splitting was used to identify the formation of a triatomic sulfur anion resulting from the reaction of elemental sulfur with partially hydroxylated magnesium oxide at 400 C. The formation of the triatomic sulfur anion was accompanied by the evolution of hydrogen sulfide and the loss of another sulfur radical which appeared to be a polymeric form of sulfur. The triatomic sulfur anion appeared to be in motion around an axis that was perpendicular to the plane of the three sulfur atoms. Elemental sulfur and sulfur ions play an important role in the behavior of catalysts for desulfurization reactions and the reduction fo sulfur dioxide over metal oxides.

57326 **APTIC NO. 77865**

Sanhueza, Eugenio and Julian Heicklen

THE REACTION OF O(3P) WITH C2HCL3. *Pennsylvania State Univ., University Park, Center for Air Environment Studies, Rept. 316-73, 26p., May 1973. 12 refs.*

The reaction of trichloroethene with atomic oxygen obtained from mercury photosensitization of nitrous oxide was studied at 25 C. The products of the reaction in the absence of molecular oxygen were carbon monoxide, chloroform, and a polymer (as well as molecular nitrogen from N2O). The quantum yields of CO and CHCl3 were 0.23 + or - 0.01 and 0.14 + or - 0.05, respectively, independent of reaction conditions. In the presence of O2, a free radical chain oxidation occurred, with long chain lengths being observed. Reaction mechanisms are postulated for each reaction. (Author abstract modified)

57327 **APTIC NO. 81285**

Wendschuh, P. H., C. T. Pate, and J. N. Pitts, Jr.

THE REACTION OF PEROXYACETYL NITRATE WITH ALDEHYDES. *Tetrahedron Letters, no. 31:2931-2934, 1973. 14 refs.*

The reaction of peroxyacetyl nitrate with aldehydes in various nonpolar solvents was investigated. Oxidation of the aldehyde to the corresponding acid was observed in each case, with the yield being approximately 85%. Other reaction products observed consisted of acetic acid, nitromethane, methyl nitrite, and carbon dioxide. Although the overall reaction products remained the same in different solvents, the reaction pathway varied with the particular solvent used. Reaction rates also were unaffected by solvent change. The stoichiometry of the reaction was not simple. There were 1-3 moles of aldehyde consumed for each mole of PAN reacted in the presence of excess aldehyde; whereas in the presence of excess PAN, the result was much the same, with about 1.5 moles of aldehyde reacting for each mole of PAN. Although the data obtained did not permit the assignment of a mechanism for the reaction, a free radical mechanism appeared to be the most probable.

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1976

57328 **APTIC NO. 81426**

DeBias, Domenic A., Chandra M. Banerjee, Newton C. Birkhead, Charlotte H. Greene, David Scott, and William V. Harrer

EFFECTS OF CARBON MONOXIDE INHALATION ON VENTRICULAR FIBRILLATION. *Arch. Environ. Health, 31(1):42-46, Jan.-Feb. 1976. 16 refs. (Presented at the American Medical Association, Air Pollution Medical Research Conference, San Francisco, Calif., Dec. 4, 1974.)*

Normal monkeys and monkeys subjected to myocardial infarction were exposed to 100 ppm carbon monoxide for 6 hr, and the vulnerability of the heart to induced fibrillation was evaluated. The mean carboxyhemoglobin concentration attained was 9.3%. The voltage required to induce fibrillation was highest for normal, air-breathing animals and lowest for infarcted animals inhaling carbon monoxide. Infarction alone and carbon monoxide alone each required significantly less voltage for the induction of fibrillation, and the effects were additive when the two were combined. (Author abstract modified)

1975

57329 **APTIC NO. 81573**

Araki, Shunichi

FACTOR-ANALYTICAL OBSERVATION ON DOSE-RESPONSE RELATIONSHIP OF LEAD IN THE OCCUPATIONALLY NON-EXPOSED. *Ind. Health (Japan), vol. 13:81-92, 1975. 22 refs. (Presented at the Meeting of the Japanese Society of Public Health, Annual, 32nd, Japan, 1973, Paper 1841.)*

Thirty-nine Japanese adults living in urban areas and not exposed occupationally or accidentally to lead were examined for parameters relevant to lead exposure. The total urine was collected for 24 hr to measure lead and delta-aminolevulinic acid. After the collection of spot urine for the measurement of coproporphyrin, intravenous infusion of CaEDTA was given for 1 hr. The urinary amounts of lead mobilized by CaEDTA in 2 hr and 24 hr from the start of infusion were analyzed. Blood samples were collected about 6 mo later to investigate the activity of delta-aminolevulinic acid dehydratase in erythrocytes (ALA-D). Lead content in the whole blood and hemoglobin level were measured after another 6 mo. The interrelationships of these parameters were statistically investigated by factor analysis. They were classified into three groups based on the results. Lead mobilized by CaEDTA and lead in blood appear related to the body burden of lead. Delta-aminolevulinic acid, coproporphyrin, and lead in urine and ALA-D in erythrocytes appear related to response to body burden of lead. Hemoglobin constitutes the third group. The possibility of specific biological reactions to lead in people free from occupational or accidental exposure to lead was supported, though the extent of the reactions was much less than in occupationallyexposed workers. Lead did not influence blood hemoglobin level under usual urban environments. The biological significance of lead in blood and CaEDTA lead mobilization tests seemed similar from the viewpoint of dose-response relationship to lead. The response of urinary coproporphyrin and erythrocyte ALA-D activity to body burden of lead was assumed to be nearly linear in people occupationally unexposed to lead. (Author abstract modified)

57330 **APTIC NO. 81123**

Aronow, Wilbert S. and John Cassidy

EFFECT OF CARBON MONOXIDE ON MAXIMAL TREADMILL EXERCISE. A STUDY IN NORMAL PERSONS. *Ann. Internal Med., 83(4):496-499, Oct. 1975. 11 refs.*

The effect that breathing 100 ppm of carbon monoxide versus compressed, purified air for 1 hr had on maximal treadmill exercise was studied in 10 middle-aged, healthy nonsmokers. The mean venous carboxyhemoglobin level significantly increased from 1.67% to 3.95% after breathing CO and significantly decreased from 1.63% to 1.3% after breathing compressed, purified air. The mean exercise time until exhaustion significantly decreased from 687.7 sec to 662.7 sec after breathing CO and insignificantly increased from 694.9 sec to 703.4 sec after breathing compressed, purified air. Ischemic S-T segment depression less than or equal to 1 mm after exercise occurred in 1 of 10 subjects after exercise following CO inhalation. Increased carboxyhemoglobin levels of the magnitude encountered after smoking for heavy atmospheric pollution impaired exercise performance in normal persons. (Author abstract modified)

57331 **APTIC NO. 81622**

Arthur, R. D., J. D. Cain, and B. F. Barrentine

THE EFFECT OF ATMOSPHERIC LEVELS OF PESTICIDES ON PESTICIDE RESIDUES IN RABBIT ADIPOSE TISSUE AND BLOOD SERA. *Bull. Environ. Contamination Toxicol., 14(6):760-764, Dec. 1975. 6 refs.*

An experiment was designed to quantify atmospheric pesticide levels and determine the pesticide uptake into adipose tissue and blood sera in rabbits placed in an area of heavy pesticide usage. Twenty rabbits each were housed in open cages in an area of high pesticide use and inside a building in an area of low pesticide usage. The rabbits were sacrificed after 3 mo, and blood samples and adipose tissue were collected. Weekly air samples were taken in the high pesticide area during the test period. Identification and quantification of the pesticides were accomplished on a gas chromatograph. The adipose tissue residues were higher in the rabbits from the high pesticide use area. Pesticide residues in blood sera were detected in none of the rabbits from the low pesticides area and only six from the high pesticides area. The daily respiratory and dietary intake were calculated for the rabbits in the high pollution area. Dietary intake was greater than respiratory intake for two of the three pesticides measured. All rabbits were fed the same diet. Exposure of animals to air in the Mississippi Delta can lead to a significant buildup of pesticide residues.

57332 **APTIC NO. 81129**

Colley, John

PASSIVE SMOKING IN CHILDREN. *Nursing Times, 71(47):1858-1859, Nov. 20, 1975. 3 refs.*

Studies on the health effects of passive smoking on children are reviewed. In a survey in Jerusalem, 10,672 infants were followed over their first year of life. Infants with mothers who smoked while pregnant had higher rates for admission to hospital for pneumonia and bronchitis than infants of non-smoking mothers. Admission rates rose in step with the number of cigarettes mothers smoked. The Harrow study in London followed up 2205 infants over the first 5 yr of life. Eight percent of infants with non-smoking parents had an attack of pneumonia or bronchitis in the first year of life, in contrast to 15% of infants whose parents between them smoked 25 or more cigarettes each day.

57333 **APTIC NO. 81250**

Francon, F. and P. Grellat

FLUOROSIS. A POLLUTION SOURCE YET IGNORED: FLUOROSIS HAZARDS IN SAVOY. *(La fluorose. Une source de pollution encore meconnue: les ravages du fluor en Savoie). Text in French. Concours Med. (Paris), 97(16):2755-2756, 2759-2760, 1975. 29 refs.*

Effects of air pollution due to fluorine and its compounds on plants, animals, and humans are reviewed. In high concentrations, fluorine is harmful for plants, especially for fruit trees and conifera. Fluorine is hazardous for insects, including honey-bees, and especially for herbivorous animals. It causes cachexia, osteomalacia, and spontaneous bone fractures in cattle. Industrial emissions are hazardous for humans, causing osteopetrosis after a long latency period, especially in the pelvis region. Osteopetrosis in an aluminum factory worker is reported; sudden elimination of the fluorine and normalization of the bones occurred 10 yr after cessation of the exposure.

57334 **APTIC NO. 81705**

French, Jean G.

EFFECTS OF SUSPENDED SULFATES ON HUMAN HEALTH. *Environ. Health Perspect., vol. 10:35-37, April 1975. 7 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

Recent evidence from epidemiologic studies conducted in several areas of the United States shows an association of excess risk of asthmatic attacks with elevated levels of suspended sulfates within specific temperature ranges. Findings from experimental animal studies tend to support these observations. Studies on guinea pigs have shown that in terms of comparative toxicity, sulfuric acid and some metallic sulfate compounds are more potent irritants than sulfur dioxide. Further experiments exposed guinea pigs to SO2, sodium chloride aerosol, and a combination of the two at high and low humidity. Significant changes in pulmonary flow resistance occurred only in the combined SO2-sodium chloride aerosol atmosphere at high relative humidity. Sulfuric acid mists produced definite deleterious effects on pulmonary structures and deterioration in pulmonary function in monkeys. Despite limitations in ambient sulfate measurement there is sufficient evidence to consider suspended sulfates as potentially injurious to human health.

57335 **APTIC NO. 81353**

Grigorevskaya, Z. P.

COMPARATIVE TOXICOLOGIC ASSESSMENT OF PERSISTENT AND INTERMITTENT ACTION OF SULFUROUS GAS ON THE BODY OF ANIMALS. *Text in Russian. Gigiena i Sanit., no. (6-11):1975. 15 refs.*

A comparative toxicological assessment was made of the persistent and intermittent action of sulfurous gas on the bodies of animals. There was a definite concentration-time relationship. In the second case the toxic effect was weaker than in the first. At the same time the intermittent action, depending on its character, caused both weakening and aggravation of the toxic effect.

57336 **APTIC NO. 78924**

Harper, C., R. T. Drew, and J. R. Fouts

SPECIES DIFFERENCES IN BENZENE HYDROXYLATION TO PHENOL BY PULMONARY AND HEPATIC MICROSOMES. *Drug Metab. Disposition, 3(5):381-388, Sept.-Oct. 1975. 32 refs.*

The metabolism of benzene to phenol by microsomal preparations from lungs and livers was compared in hamsters, rats, and rabbits. There were wide differences in the apparent maximum velocity of benzene hydroxylation among the various species and tissues and smaller differences in the apparent values of the Michaelis-Menten constant for benzene hydroxylase. Benzene can inhibit its own metabolism in vitro when present in high concentrations. Phenol was the only metabolite of benzene identified in incubation mixtures containing microsomes from lung or liver of any of the three animal species. When incubated with microsomes under the conditions used to measure benzene metabolism, phenol was further metabolized in liver but not in lung preparations. Phenol metabolism was almost completely inhibited when 11.2 millimoles benzene was included in the incubation mixture containing hepatic microsomes. The variation in rates of benzene hydroxylation by microsomal preparations from lungs or livers of the three animal species was similar to the variation in rates of benzpyrene hydroxylation in the same preparations. (Author abstract)

57337 **APTIC NO. 81606**

Hata, T., T. Saito, M. Saito, K. Aihara, S. Miyahara, G. Yajima, K. Suzuki, M. Owada, Y. Suzuki, Y. Son, and S. Gon

ON THE ULTRAMICROMORPHOLOGICAL ALTERATION OF TYPE II ALVEOLAR EPITHELIAL CELLS OF INFANTILE AND ADULT RABBITS EXPOSED TO NITROGEN DIOXIDE, AND THE EFFECT OF VITAMIN E ON THE ALTERATION. *(NO2 fuka yojaku oyobi seijuku kato ni okeru II gata haihojohi saibo no chobikeitaigakuteki henka oyobi sore ni taisuru Vitamin E no eikyo ni tsuite). Text in Japanese. Igaku to Kaimenkassei (J. Japan Soc. Biol. Interface), 6(1):31-34, 1975. 2 refs.*

Infantile and adult rabbits were exposed to nitrogen dioxide at rates of 5 l/min for 30 min. After confirming their dyspnea, their lung tissue was removed and observed by light and electron microscope. In infantile rabbits, the height of type II alveolar epithelial cells was relatively low and they were poor in microvilli covering the superficial layer. Accumulation of coarse granular proteinous cellular debris was observed in the alveolar cavity. The osmiophillic body was smaller in size with higher electron density and with a disturbed layer structure. The vessel wall was thickened with conspicuous micropinocytosis in the endothelial cells. In adult rabbits, severance and disappearance of microvilli were found, with conspicuous irregular vacuolation in the cytoplasm of type II epithelial cells, and alternations of the layer structure of osmiophillic bodies. In alveolar membranes, the phospholipid layer was severed and disappeared. Infantile and adult rabbits given Vitamin E before the exposure showed relatively well maintained morphology of osmiophillic bodies. Although not yet confirmed, the role of vitamin E as an antioxidant and its function as a lysosomal stabilizer were apparent.

57338 **APTIC NO. 81707**

Hysell, D. K., W. Moore, R. Hinners, M. Malanchuk, R. Miller, and J. F. Stara

INHALATION TOXICOLOGY OF AUTOMOTIVE EMISSIONS AS AFFECTED BY AN OXIDATION EXHAUST CATALYST. *Environ. Health Perspect., vol. 10:57-62, April 1975. 2 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

Preliminary data are given from animal studies on the acute inhalation toxicology of automobile exhaust from engines equipped with or without oxidative catalytic converters. Three studies are discussed. The first was a study of the biological effects of whole exhaust from an automobile engine with no catalyst, which served as a reference or baseline study. The second was identical except for the addition of an oxidative catalyst to the exhaust train. The third had the catalyst plus additional organic sulfur compounds added to the fuel to maximize production of sulfate emissions. The catalyst effectively reduced carbon monoxide and hydrocarbons in the exhaust which apparently had an effect, at least in a closed exposure system, on oxidant and nitrogen dioxide levels by altering the ratio of HC to oxides of nitrogen. There was a resultant reduction in biological effects due to the exposure. The catalyst altered the type of particulate to one which probably contained sulfuric acid as a major component. No evidence was present in these acute exposures to suggest a toxic response due to the higher sulfate emissions or possible catalyst attrition products. (Author abstract modified)

57339 **APTIC NO. 81255**

Igata, A. and R. Hamada

STATISTICAL STUDIES ON THE DIAGNOSIS OF HEALTH DISTURBANCE DUE TO ENVIRONMENTAL POLLUTION. *(Kogaini yoru kenkohigai shindan ni kansuru suritokeiteki kenkyu). Text in Japanese. Nihon Naika Gakkai Zasshi (Tokyo) (J. Japan. Soc. Intern. Med.), 64(9):1020-1021, 1975.*

Because of the wide distribution of environmental pollution, it is sometimes a problem to know for which patients the disease is due to pollution. The disease state of the whole pollution in a polluted area was studied, and a method of diagnosis with a definite standard was proposed. The method was applied to arsenic-poisoned inhabitants of the Toroku area, Miyazaki Prefecture, believed due to air and water pollution caused by an arsenic mine.

57340 **APTIC NO. 81403**

Johnson, D. E., J. B. Tillery, and R. J. Prevost

TRACE METALS IN OCCUPATIONALLY AND NONOCCUPATIONALLY EXPOSED INDIVIDUALS. *Environ. Health Perspect., vol. 10:151-158, April 1975. 20 refs. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

An epidemiological survey was conducted in Houston, Texas on five trace metals in policemen, parking garage attendants, women living near freeways, and three control groups of subjects. The controls were matched with the exposed groups for covariate information such as age, sex, smoking habits, ethnic background, socioeconomic status, hair color, and education. Each subject was sampled four times for blood, urine, hair, and feces, and these samples were analyzed for lead, cadmium, zinc, manganese, and copper. Lead and cadmium were correlated with airborne exposures but zinc, manganese, and copper were not. A market study of platinum and palladium markets was also made. A design of an epidemiology survey of individuals occupationally and nonoccupationally exposed to these two metals is discussed. The market survey shows that although the catalytic muffler will have a major impact on the market, producers can meet these demands. (Author abstract)

57341 **APTIC NO. 74167**

Kawahara, H. and I. Kitamura

AIR POLLUTION AND THE RESULTS OF HEALTH INVESTIGATION ON INFANTS. *(Taiki-osen to yoji no kenkochosa). Text in Japanese. Koshu Eisei Joho (Public Health Inform.), 5(3):22, March 1975.*

Medical investigations were carried out in October 1973 on 377 children from 3 to 6 yr in age living in highly air polluted areas and on 289 children living in relatively less air polluted areas of Okayama Prefecture. The major air pollutants were sulfur oxides. The sex and age-ratios were standardized. The frequency of bronchial asthma plus that of bronchitis was 6.1% in the polluted area and 3.1% in the less polluted area. The frequency of complaints of colds (more than 7 days/yr), nasal discharge, discharge from the eyes, cough, and asthma was also greater in the more polluted area as were the number of quasi bronchial asthmatic children and the degree of dyspnea. Seasonal changes in symptoms of the upper airways did not differ between locations. Disease occurrence was more frequent during the winter.

57342 **APTIC NO. 78940**

Klosterkoetter, Werner and Klaus Robock

NEW ASPECTS ON DUST AND PNEUMOCONIOSIS RESEARCH. *Am. Ind. Hyg. Assoc. J., 36(9):659-668, Sept. 1975. 13 refs.*

Investigations on pneumoconiosis are reviewed with emphasis on fibrotic tissue reactions caused by silica and asbestos dusts in the lungs. Primarily, SiO2 dust particles appear on the outside cell membrane of the macrophages. The adsorption and catalytic activation of membrane lipoids or membrane enzyme on the surface of SiO2 dust particles in connection with electron transfer reactions are responsible for the lesions. There is no relation between the electron structure of the asbestos dusts and their cytotoxicity as with the SiO2 dusts. The specific pathogenicity of fibrous asbestos dusts is not determined by their chemical composition or molecular structure. The geometry of the fibers is of decisive importance for the aerodynamic behavior, i.e., the capability of being deposited in the alveolar range of the lung as well as for the interaction with the macrophages, and for the effects in the lung tissue. Cytotoxicity, fibrogenicity, and carcinogenicity are due to the effect of a mechanical irritation by the fibers.

57343 **APTIC NO. 73934**

Kobayashi, Yoshitaka

LEAD IN THE ENVIRONMENT AND ITS EFFECTS ON MAN - LEAD CONCENTRATION IN THE ENVIRONMENT AND IN URINE OF INHABITANTS OF KANAGAWA PREFECTURE. *Bull. Fac. Eng., Yokohama Natl. Univ., vol. 24:23-35, March 1975. 29 refs.*

Airborne lead, cadmium, and iron concentrations along roads with heavy motor vehicle traffic and in residential areas of Yokohama City were measured. The mean values for lead, cadmium, and iron during the period from March 1970 to January 1971 were 0.63, 0.01, and 6.5 micrograms/cu m, respectively. The highest airborne lead concentration (10 micrograms/cu m) was recorded in an area with heavy traffic. Indoor lead concentrations were 60-70% of outdoor values. The lead content of rain water was proportional to the lead concentration in the air. Soil lead values ranged from 20-40 ppm, with the lead being in an almost insoluble state. Urinary lead concentrations for elementary school boys varied from 1-136 micrograms/l and averaged 37.5 micrograms/l with a standard deviation of 17.87. There was no correlation between airborne lead concentrations and urinary lead concentrations.

57344 **APTIC NO. 81200**

Kumashiro, K., M. Ikeda, and M. Kawase

EFFECTS OF AUTO EXHAUST ON POLICEMEN DUE TO TRAFFIC PART 1. RESULTS OF EXAMINATION ON ANEMIA DUE TO LEAD. *(Jidosha-haigas no kotsukankei keisatsukan ni oyobosu eikyo ni tsuite, 1. Namarihinketsu ni kansuru kensaseiseki). Text in Japanese. Okayama-Ken Eisei Kenkyusho Nenpo (Ann. Rept. Hyg. Lab Okayama), no. 22:113-114, 1975.*

Anemia due to lead was examined in 72 policemen in outside duty in Okayama Prefecture. Hemoglobin was on the average 15.8g/dl (range 13.0-18.3), the specific gravity of blood was 1.509/range 1.055-1.060), delta-ALA dehydrase in blood was 0.85 micromole PBG/hr/mlRBC (range 0.39-1.27), delta-ALA in urine was 2.7 mg/dl (range 0.6-6.4) and lead in blood was 10 plus or minus 4 g/dl (range 3-25). The hemoglobin content, specific gravity, urinal delta-ALA and lead content of blood were normal; however, 8.3% of examined policemen showed lower value of delta-ALA dehydrase activity than normal range. Although there were some specific anomalies in delta-ALA dehydrase activity the present level of lead contained in auto exhausts was thought not to affect the human body.

57345 **APTIC NO. 77670**

Lee, S. D., M. Richards, L. McMillan, R. Shelley, and V. N. Finelli

EFFECTS OF VARIOUS METAL SULFATES ON SUCCINATE-DEPENDENT RESPIRATION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 11p., 1975. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-31.6.)*

The comparative toxicity of selected sulfates and other reference toxicants was investigated in in vitro and in vivo systems. The sulfate ion in tissue slices or in homogenate of rat does not affect the respiratory chain. Among the cations, cadmium ++ is the most potent inhibitor. It inhibits the oxygen uptake by approximately 50% at 2 times 10 to the -7th power M and 100% at 0.000033 M. Other cations, such as manganese ++, magnesium ++, and calcium ++ are not inhibitory at concentrations up to 0.0010 M, but have a slight stimulatory effect. Cerium +++, sodium +, and ammonium + do not cause any effect. Intragastric administration of a single and multiple dose of cadmium sulfate, platinum sulfate, and palladium sulfate at 8 and 80 micromole/kg body wt, do not affect succinate dependent respiration in any of the organ tissues tested (kidney, liver, heart, and lung). (Author abstract modified)

57346 **APTIC NO. 81076**

Lockeretz, William

LEAD CONTENT OF DECIDUOUS TEETH OF CHILDREN IN DIFFERENT ENVIRONMENTS. *Arch. Environ. Health, 30(12):583-587, Dec. 1975. 22 refs.*

The lead content of teeth of children in five different environments was measured to determine the relative contribution of different sources of Pb. The importance of Pb paint in children living in dilapidated housing was clearly observed, but not effect attributable to automobile exhaust of industrial emissions was apparent. High Pb levels were found among children living in new public housing projects within the high Pb area of the city, even though a Pb paint problem presumably should not have existed in the project themselves. The data were analyzed to determine the frequency with which excessive Pb contents occurred in the problem area in comparison to a low risk area. (Author abstract modified)

57347 **APTIC NO. 81074**

Maatta, Kari and Antti U. Arstila

PULMONARY DEPOSITS OF TITANIUM DIOXIDE IN CYTOLOGIC AND LUNG BIOPSY SPECIMENS. LIGHT AND ELECTRON MICROSCOPIC X-RAY ANALYSIS. *Lab. Invest., 33(3):342-346, Sept. 1975. 13 refs.*

Open lung biopsy samples and sputum specimens from three former titanium dioxide factory workers and bronchial aspirations from seven TiO2 factory workers were analyzed by conventional and X-ray microanalytic light and electron microscopic methods. In the alveolar macrophages, lysosomes contain a significant amount of titanium as well as smaller amounts of silicon, aluminum, iron, and potassium. Titanium dioxide was in round or oval-shaped particles whereas silica or silicon compounds were localized in separate, more rectangular structures. The adverse effects may be induced by such quartz or silicon compounds. The latter are utilized as covering substance in the manufacture of TiO2 pigment. (Author abstract modified)

57348 **APTIC NO. 81254**

Mizoguchi, I.

ALTERATION OF SUBJECTIVE SYMPTOMS CAUSED BY PHOTOCHEMICAL SMOG - A STUDY CONCERN-

ING PREDISPOSITION OF SCHOOLCHILDREN. *(Kokagaku sumogu ni yoru jikakyshojo no hendo. Soin tono kanren ni okeru ichikosatsu). Text in Japanese. Tokyo Eisei Kenkyusho Nenpo (Annu. Rep. Tokyo Met. Res. Lab Pub. Health), 26(1):289-293, 1975. 11 refs.*

Subjective symptoms of middle schoolchildren related to photochemical smog was surveyed in May-July, 1974 in 515 children. Frequencies of eye-complaints, throat-complaints, coughing, shortness of breath and headache were significantly correlated with concentration of oxidants. Out of 515 children, 47 cases of orthostatic ataxia, 74 of allergy, and 20 with an asthmatic history were found. The percentage of complaints for each group was compared. The orthostatic ataxia group had more complaints than the others. The allergy and asthmatic groups had more complaints about coughing and phlegm.

57349 **APTIC NO. 81162**

Momiyama-Sakamoto, Masako, Juichiro Takeuchi, and Kunie Katayama

SIGNS SEEN IN JAPAN OF DESEASONALITY IN HUMAN MORTALITY. *Papers Meteorol. Geophys. (Tokyo), 26(2):9-34, June 1975. 9 refs.*

Trends in the seasonal variation of mortality in Japan are discussed. There is evidence that the winter peak of total mortality for certain diseases (including cerebrovascular disease, cardiovascular disease, heart disease, pneumonia, and bronchitis, and especially for infants and old people) has begun to flatten out. Improved heating systems, dependent on the availability of cheap fuel oil, may be an important factor, but the shortage of liquid fuels may halt or reverse the trend. Space heating in dwellings is a less important source of air pollution than industrial emissions; the benefits of restrictive regulation of fuels for this purpose must be weighed against the health effects.

57350 **APTIC NO. 76996**

Moore, W., Jr., D. Hysell, W. Crocker, and J. Stara

BIOLOGICAL FATE OF A SINGLE ADMINISTRATION OF PLATINUM-191 IN RATS FOLLOWING DIFFERENT ROUTES OF EXPOSURE. *Environ. Res., 9(2): 152-158, April 1975. 6 refs.*

The retention, tissue distribution, and excretion of platinum-191 in adult rats was determined following oral, intravenous, and intratracheal administration in order to gain information on the biological fate of the metal which is used in catalytic converters. The highest retention was obtained following intravenous dosing and the lowest retention occurred after oral administration. Tissues containing the highest concentrations of Pt-191 following intravenous administration were the kidney, adrenal, spleen, and liver. The distribution of Pt following intratracheal administration was similar to that following intravenous administration. Almost all of the Pt was excreted in the feces after a single oral dose due to nonabsorption. Intravenous administration of Pt-191 to pregnant rats resulted in small amounts (0.01% of dose/g) of the metal accumulating in all of the fetuses. Ingestion and inhalation probably comprise the two major routes of human exposure to Pt. (Author abstract modified)

57351 **APTIC NO. 74696**

Nagaoka, S.

HUMAN EFFECTS OF PHOTOCHEMICAL SMOG. *(Kokagaku smog no jintai eikyo). Text in Japanese. PPM (Japan), 6(8):42-46, Aug. 1975.*

Methods of studying the human effects of photochemical smog are described. Photochemical smog which irritates the eyes in a very complex way is not fully understood in terms of its components. The effects of photochemical smog on the respiratory system are explained by damage to the protective coating of respiratory organs. Symptoms other than the ocular and respiratory type are not defined yet in terms of the primary effect of photochemical smog or secondary effects brought about by the primary effect. Threshold values of ozone are reported based on human and animal experimental data.

57352 **APTIC NO. 81392**

Nakagawa, S., S. Agasato, H. Matsubara, and T. Ikemi

EFFECTS OF AIR POLLUTION ON AIRWAY DISEASES CENTERING ON ASTHMA - CONSIDERATION FROM PSYCHOSOMATIC MEDICINE. *(Kidoshikkan (Zensoku o chushin to shita) ni taisuru taikiosen no eikyo ni tsuite - Shinshin igakuteki kosatsu). Text in Japanese. Seishin Shintai Igaku (J. Jap. Psychosom. Soc.), 14(5):323-324, 1975.*

An epidemiological, clinical, and psychosomatic survey of 7856 employees in 108 factories in air polluted areas of Kitakyushu City was conducted. The frequency of asthma was generally higher in air polluted areas. Occupation-related pollution, smoking, retrocedent personalities, hypochondriacal tendencies and the belief that the air pollutant is the direct cause of asthmatic paroxysm apparently accentuated the asthmatic paroxysm. A survey of 137,415 schoolchildren divided into three categories (typically severe, light and atypical), showed that the morbidity of asthma was higher in highly air-polluted areas, and immunoglobulin E values in typical asthmatic children were frequently more than 700 gamma. Psychic factors were found to have a strong connection to typical asthma.

57353 **APTIC NO. 81032**

Neri, L. C., J. S. Mandel, D. Hewitt, and D. Jurkowski

CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN TWO CITIES OF CONTRASTING AIR QUALITY. *Can. Med. Assoc. (Toronto) J., 113(11/12):1043-1046, Dec. 13, 1975. 10 refs.*

Chronic obstructive pulmonary disease was investigated in two cities of constrasting air quality. Spirometric tests were made of 3280 Ottawa residents in 1969-1971 and 2208 Sudbury residents in 1972-1973. The mean ratio of forced vital capacity to forced expiratory volume in 1 sec was lower is Sudbury, where sulfur dioxide concentrations in the air tended to be appreciably higher than in Ottawa. This difference was significant for both males and females considered separately, and held true when age and smoking habits were taken into account. The prevalence of symptomatic chronic bronchitis was significantly higher in Sudbury males than in Ottawa males, but no such difference was detected in females. (Author abstract modified)

57354 **APTIC NO. 81258**

Nishida, M., T. Ikeda, K. Toyoshima, K. Tomita, N. Kawa, N. Nakata, T. Kamata, and S. Sugawara

ON INFANTILE BRONCHIAL ASTHMA IN THE AIR POLLUTED AREA IN OSAKA PREFECTURE. *(Osakafuka ni okeru taikiosenchiku no shoni-kikanshi zensokuni tsuite). Text in Japanese. Nihon Shonika Gakkai Zasshi (Soc. Pediatr. Jap.), 79(10):790, 1975.*

Infantile bronchial asthma was surveyed in the air-polluted Nishiyodogawa Ward of Osaka City, and in non-polluted areas. The morbidity of bronchial asthma and of atypical asthma for 9266 children in 11 schools in the polluted area was, respectively, 1.8 and 3.6%. The morbidity of 20,003 children in 31 schools in non-polluted areas was, respectively, 1.8 and 1.9%. Taking the sum of both asthmas, the total morbidity was relatively high. The children suffering from bronchial asthma in air-polluted areas showed lower positivity in intracutaneous tests with house dust and a lower increase of acidocytes than those in non-polluted areas, while those in non-polluted areas showed a high positivity in intracutaneous tests with pollens of hog weed. The former suggests a relation of air pollution and the latter suggests an allergic factor. Air pollution should be considered as a factor in refractory asthma.

57355 **APTIC NO. 81033**

Noweir, Madbuli H., Ezzat K. Amine, and Hassan A. Osman

EPIDEMIOLOGICAL INVESTIGATION OF THE ROLE OF FAMILY SUSCEPTIBILITY AND OCCUPATIONAL AND FAMILY HISTORIES IN THE DEVELOPMENT OF BYSSINOSIS AMONG WORKERS EXPOSED TO FLAX DUST. *Brit. J. Ind. Med. (London), 32(4):297-301, 1975. 5 refs.*

The role of family susceptibility and occupational and family histories in the development of byssinosis among 475 workers exposed to flax dust was investigated in an epidemiological investigation. Workers whose fathers had an occupational history of exposure to flax dust were more resistant to the development of the disease than those whose fathers had no such history. Such tolerance was much higher in workers whose fathers were byssinotic than in those whose fathers were not. (Author abstract modified)

57356 **APTIC NO. 81078**

Saric, M. and O. Hrustic

EXPOSURE TO AIRBORNE MANGANESE AND ARTERIAL BLOOD PRESSURE. *Environ. Res., 10(2):314-318, Oct. 1975. 5 refs.*

Arterial blood pressure was measured and compared in three groups of male workers aged 20-59 at different exposure levels to airborne manganese. The lowest mean values of the systolic blood pressure were found in workers with the highest occupational exposure to manganese, although the group was also comparatively the oldest. The mean values of the diastolic blood pressure did not follow those of the systolic pressure. The lowest mean diastolic pressure values were found in control workers. In the evaluation of the possibility that the airborne Mn in the working environment acts by reducing the systolic pressure values, age, body bulk, and smoking habits were considered. (Author abstract modified)

57357 **APTIC NO. 77546**

Shitskova, A. P.

HYGIENIC ASPECTS OF PROPHYLAXIS OF CARDIOVASCULAR PATHOLOGY. *Text in Russian. Vestn. Akad. Med. Nauk SSSR, vol. 3:9-15, 1975. 19 refs.*

The importance of occupational and other environmental factors which contribute to the development of cardiovascular disorders is discussed. Effects of physical and chemical occupational factors on the cardiovascular system are considered. Material characterizing the role of such environmental factors as pollution of the atmospheric air with toxic substances, city noise, and others in the shifts of the cardiovascular systems observed in experimental animals and in nature is presented. Special attention is paid to hygienic arrangements in prophylaxis of cardiovascular pathology.

57358 **APTIC NO. 81240**

Sidorenko, G. I. and A. I. Izkowa

NICKEL AS A FACTOR OF ENVIRONMENTAL POLLUTION. *(Nickel als Faktor der Umweltverunreinigung). Text in German. Z. ges. Hyg. ihre Grenzgebiete (Berlin), 21(10):733-736, 1975. 7 refs.*

The chronic effects of nickel chloride on albino rats after oral intake or inhalation and combined absorption were studied. The animals were given drinking-water with 0.1, 1, 10, and 100 mg of nickel chloride/liter, corresponding to doses of 0.005, 0.05, 0.5 and 5 mg/kg, for 6 mo. Another group inhaled nickel chloride aerosol in concentrations of 0.002, 0.001, 0.005, and 0.5 mg/cu m, while a third group was given drinking-water and exposed to nickel chloride aerosol at the same doses and concentrations. Reduction of iodine fixation by the thyroid gland, increaded protein-bound iodine in the serum, and reduction of the blood catalase, succinate dehydrogenase, and lymphocyte alpha-glycerophosphate dehydrogenase activities were found. The changes were most pronounced after inhalation. The threshold dose and threshold concentrations were determined to be 0.05 mg/kg and 0.001 mg/cu m, respectively, and the no-effect levels were 0.005 mg/kg and 0.002 mg/cu m. After combined oral and inhalative uptake, a potentiating effect on erythrocytes, and a summation effect on the iodine fixation function of the thyroid gland were observed. The maximum allowable concentration of soluble nickel compounds in drinking-water and in air is recommended to be set at 01. mg/liter and at 0.0002 mg/cu m, respectively.

57359 **APTIC NO. 78353**

Smith, Richard Merrill and Vu-Dinh Dinh

CHANGES IN FORCED EXPIRATORY FLOW DUE TO AIR POLLUTION FROM FIREWORKS. PRELIMINARY REPORT. *Environ. Res., 9(3):321-331, 1975. 10 refs.*

Spirometry in humans and air sampling were performed during a brief but intense bout of air pollution (sulfur dioxide and particulate matter) due to exploding fireworks on New Year s Eve in Honolulu, Hawaii. An integrating nephelometer recorded a peak concentration of respirable particles in excess of 3.8 mg/cu m. X-ray dispersive analysis, combined with scanning electron microscopy of particles collected with an Anderson cascade impactor, indicate that most of the small particles are probably crystals of potassium chloride. Conditions are ideal for a possible SO2-KCL aerosol synergism which causes measured changes in maximal midexpiratory flow (forced expiratory flow (FEV) 25-75%). Two male subjects with a history of chronic respiratory disease experienced an average decrease of 26% in FEV 25-75%, when compared to that measured the previous night. Three normal males experienced a 4.7% decrease approaching statistical significance, but the overall difference in FEV 25-75% in healthy male and female subjects combined was not statistically significant. (Author abstract modified)

57360 **APTIC NO. 81277**

Sochocky, S.

ARTERIOSCLEROTIC HEART DISEASE AND ENVIRONMENT. *South Dakota J. Med., 28(1):23-25, Jan. 1975. 13 refs.*

The effect of air pollution on arteriosclerotic heart disease is described. Air pollution associated with a high level of sulfur dioxide is associated with a marked increase of death from heart disease in London. Industrial workers exposed to SO2 show an increased death rate from heart disease.

57361 **APTIC NO. 81174**

Takayama, Y.

STUDY OF CLINICAL STATUS OF SCHOOLCHILDREN S BRONCHIAL ASTHMA IN FUJI CITY. *(Fuji-shi gakudo kikanshi zensoku no rinshozo ni kansuru kenkyu). Text in Japanese. Arerugi (Japan. J. Allergy), 24(7):562-576, 1975. 96 refs.*

Schoolchildren who live in Fuji City and neighboring areas in which the degree of air pollution differs, were clinically diagnosed to have bronchial asthma. The disease status was analyzed for 163 patients to examine the relationship to air pollution. The disease occurred more frequently in boys. Frequency of allergic history showed no difference between the 3 areas which had different degrees of air pollution, while the frequency was higher for patients than for children without the disease. The age of asthmatic onset was younger (2 years old) in more polluted areas. Seasonal occurrence of fits was seen, especially in autumn and winter in highly polluted areas. Increases of eosinophiles were seen in the peripheral blood, mucous, and sputum. Airway hypersensitivity was seen equally in children in the 3 areas. The correlation with commercial inhalation antigen was generally low; however, the response to the patient s own house dust, pine trees, and some fungi was noticeable. The Ig of patients in more polluted areas showed a lower value than in other areas, and about 50% of the patients showed IgE values as high as 700 unit/ml. These findings indicate that infantile bronchial asthma in air polluted Fuji City was based on the predisposition to allergic reaction.

57362 **APTIC NO. 78999**

Tejnorova, I.

METABOLISM OF SULPHUR DIOXIDE AND ITS INFLUENCE UPON HUMAN ORGANISM IN THE LIGHT OF CONTEMPORARY LITERARY DATA. *(Metabolismus kyslicniku siriciteho a jeho vliv na organismus podle soucasnych literarnich udaju). Text in Czech. Cesk. Hyg. (Prague), 18(9):428-433, 1973. 65 refs.*

A literature survey reviews attempts to determine sulfur dioxide absorption values in the respiratory tract by means of inhalation experiments using sulfur 35 and to detect distribution of the iostope in tissues and organs. Another approach involves studying in vivo and in vitro reactions of sulfite ions with disulfide compounds in the formation of corresponding thioderivates. Elimination of labelled sulfate after inhalation of SO2 containing S35 points to oxidation of sulfites in the organism. The mechanism of oxidation of endogenic as well as exogenic sulfites is being studied. The action of sulfur dioxide and sulfite ions upon a series of organic, tissue or cellular functions is also being studied, both for inhalation or parenteral routes. In vitro experiments are also being used to investigate these problems. (Author abstract modified)

57363 **APTIC NO. 81073**

Trefny, J.

SOME EFFECTS OF ATMOSPHERICAL POLLUTION ON HUMAN HEALTH OBSERVED IN CZECHOSLOVAKIA. *(Nektere vlivy znecisteneho ovzdusi na lidske zdravi pozorovane v Ceskoslovensku). Text in Czech. Studia Pneumol. Phtiseol. Cech., 35(4):268-272, 1975. 22 refs.*

The influence of air pollution on comparable groups of population living in areas with polluted air and those with clean was investigated in Czechoslovakia. In children, 0-6 yr, living in polluted areas, there was a significantly higher incidence of pneumonia and bronchopneumonia. The growth and development (weight and height) of children 9-10 yr living in districts heavily polluted by smoke and dust were negatively affected. Bone maturation was retarded by 6-10 mo. In children living in districts heavily polluted by sulfur oxides microcytar, polycythamia was found. There was a significant difference (1.7%) in the prevalence of chronic bronchitis in children aged 15 yr living in a district with relatively clear air and in a town with heavily polluted air (3.4%). The absolute number of cases of occupational silicosis decreased in Czechoslovakia from 1905 in 1958 to 721 in 1971. The absolute number of new cases of occupational silicotuberculosis did not change substantially in the same period (142 in 1971).

57364 **APTIC NO. 74140**

Tsukada, H., H. Ogawara, T. Yanome, and I. Nakamura

ON THE RESULTS OF HEALTH EXAMINATION AND DETERMINATION OF NITROGEN IN AIR IN THE CHERRY BLOSSOM SEASON AT KAMAKURA, 1974. *(Showa 49-nen, Kamakura-shi ni okeru hanami season taikichu nisankachisso no sokutei to jumin no kenko-chosa kekka ni tsuite). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo (Japan) p. 292-293, 1975. (Presented at the Executive Committee for Symposium of Environmental Sciences, 1st Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975.)*

Air pollution measurements and health statistics for Kamakura, Japan are reported for the period March 29 to April 17, 1974. The city is heavily conjested with automobile traffic. Nitrogen dioxide concentrations averaged 0.059 ppm and were far higher than the environmental standard. Among 55 inhabitants, 19.1% complained of subjective symptoms such as soreness in the throat (49%) and eye irritation (29%). The morbidity of inhabitant living adjacent roads was 20.6%, about 2.3 times that of people living in areas removed from roads.

57365 **APTIC NO. 77434**

Van Der Lende, R., C. Huygen, E. J. Jansen-Koster, S. Knijpstra, R. Peset, P. H. Quanjer, B. F. Visser, E. H. E. Wolfs, and N. G. M. Orie

A TEMPORARY DECREASE OF THE VENTILATORY FUNCTION OF THE LUNGS IN SOME INHABITANTS OF VLAANRDINGEN DURING AN ACUTE RISE OF THE DEGREE OF AIR POLLUTION. *(Een tijdelijke vermindering van de ventilatoire longfunctie bij een deel van de inwoners van Vlaardingen tijdens een acute verhoging van de luchtverontreiniging). Text in Dutch. Ned. Tijdschr. Geneesk (Haarlem), 119(15):584-588, April 12, 1975. 7 refs.*

The majority of individuals from random populations sampled in Vlaardingen during an acute air pollution episode in October of 1969 showed a lower vital capacity and a lower 1-second forced expiratory volume. The possibility of brief air pollution episodes masking possible pulmonary disorders resulting from long-term exposure to air pollution makes it advisable to conduct new epidemiological studies in which comparisons of polluted and non-polluted areas are made during periods when air pollution episodes are rare.

57366 **APTIC NO. 81470**

Wakisaka, Ichiro

SENSORY IRRITATION OF THE UPPER RESPIRATORY TRACT BY SULFUR DIOXIDE. *Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 30(5): 543-548, 1975. 16 refs.*

The respiratory reaction produced by sulfur dioxide was studied in mice. Seven groups, each of four mice, were exposed to SO2 at 0, 23, 38, 75, 128, 250, or 500 ppm for 10 min. The respiratory rate was calculated for each 15-second interval during the first 5 min of exposure and every min thereafter until the end of exposure. Four groups, each of four mice, were exposed to xylocain aerosol of approximately 0.1 mg/l air for 5 min immediately followed by exposure to SO2 at 36, 75, 130, or 307 ppm for 10 min. The respiratory rate was calculated every 15 sec. Two groups of four mice were exposed repeatedly to SO2 at 89 ppm or 278 ppm for 2 min of fresh room air for recovery between successive exposures. The respiratory rate was calculated every 15 sec. Six groups of four mice were exposed to 23 ppm SO2 followed by 43, 108, or 308 ppm SO2, to 43 ppm SO2 followed by 114 or 316 ppm SO2, and to 108 ppm SO2 followed by 316 ppm SO2. The respiratory rate was calculated very 15 sec during the first 5 min of exposure and every min thereafter in each 10 min exposure. Irritation by SO2 was accompanied by a rapid decrease in respiratory rate which reached a peak within a few min and was followed by a gradual recovery while exposure continued. The degree of maximum response was directly proportional to the SO2 concentration. Xylocain aerosol did not change the respiratory response to SO2. Mice desensitized to the sensory irritation of a given concentration of SO2 still reacted to a higher concentration of SO2, but less sensitively than mice not previously exposed to SO2. The rate of desensitization was dependent on time rather than SO2 concentration, but there is apparently a certain limit in the magnitude of desensitization which depends on the SO2 concentration. (Author abstract modified)

57367 **APTIC NO. 81156**

Wettig, K. and H. Obrikat

ON THE INVESTIGATION INTO THE MECHANISM OF CANCER DEVELOPMENT FOR COMMUNITY HYGIENIC PROPHYLAXIS. *(Zur Untersuchung der Mechanismen der Kanzerogenese fuer die kommunalhygienische Prophylaxe). Text in German. Z. ges. Hyg. Ihre Grenzgebiete (Berlin), 21(10): 736-738, 1975. 7 refs.*

Studies on the effects of carcinogenic substances and their combinations on the animal organism are reviewed, and a prescreening test system for carcinogens is proposed. Little is known about the effects of combinations of carcinogens pertaining to different classes, e.g., hydrocarbons, amines, aflatoxins, and nitrosamines. It will be necessary to establish biologically equivalent doses for carcinogens in analogy to the pharmacological practice. Attenuation of the carcinogenic action of certain combinations of aromatic polycyclic hydrocarbons relative to that of the individual components was observed. This applies to such combinations as benzopyrene and methylcholanthrene, 1,2-benzoanthracene and 9,10-dimethylbenzoanthracene, and methylcholanthrene, and chrysene. The metabolism of 3,4-benzo(a)pyrene was slowed down by the addition of certain fractions of 3,4-benzo(a)pyrene-free dust extracts, but it is not known whether this implies an increased or decreased carcinogenic potency. No difference was found in the tumor incidence among 7000 mice exposed to the air of Los Angeles and another group inhaling filtered air. Mixtures of carcinogenic hydrocarbons exerted more powerful influence on metabolic processes in Saccharomyces cerevisiae than did the individual carcinogens, which may indicate an intensified detoxication process. A chain of in vitro test systems for prescreening, and subsequent testing of the suspect carcinogens on the whole animal are proposed for screening of carcinogens.

57368 **APTIC NO. 81398**

Yoda, Hiroshi

EFFECTS OF LONG-TERM EXPOSURE TO LOW CONCENTRATION OF SULFUR DIOXIDE ON THE MOUSE RESPIRATORY ORGANS WITH REFERENCE TO ELECTRON MICROSCOPIC OBSERVATION. *(Teinodo aryusangasu chokibakuro no mausu kokyuki ni oyobosu eikyo, Paato 2. Denkenteki kansatsu o chushin ni). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), 13(8):443-451, Aug. 1975. 16 refs.*

Five 6-week old dd-female mice were exposed to gaseous sulfur dioxide at 0.233 ppm continuously for 3 months, then sacrificed by cervical luxation. Their trachea and part of their lungs were sliced, stained, and observed by electron microscope. An increase and dilation of vesicles was seen in ciliated and non-ciliated cells in tracheal epithelium, and was assumed to represent an increase of secretion due to stimulation by sulfur dioxide and sulfuric acid. No more conspicuous alteration was seen in ciliated and non-ciliated cells in bronchial epithelium and in clara cells in bronchiolar epithelium. Almost no alteration was found in alveolar epithelium and capillary endothelium.

57369 **APTIC NO. 74144**

Yuki, M.

TWO SIDES CONCERNING ASTHMA DUE TO ENVIRONMENTAL POLLUTION AND A GENERAL THEORY FOR OVERCOMING THE DISEASE. *(Kogai zensoku ni kansuru futatsu no sokumen to kokufuku e no ippan ronri). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo (Japan), p. 256-257, 1975. (Presented at the Executive Committee for Sympsoium of Environmenta Sciences, 1st Research Presentation Meeting, Tokyo (Japan), June 6-8, 1975.)*

Constitutional differences among people living in air polluted areas are discussed, with particular emphasis on asthma attacks. The observation that only some people living in such areas encounter asthma attacks suggests that constitutional factors, in addition to air pollution, are responsible for the respiratory disorder.

57370 **APTIC NO. 81437**

Zorn, H.

CHANGES IN THE BLOOD AFTER LONG-TERM EXPOSURE TO NITROUS GASES. *(Blutveraenderungen nach langfristiger Exposition gegenueber nitrosen Gasen). Text in German. Zbl. Arbeitsmed., 25(7): 208-209, 1975. 4 refs.*

The effect of nitrogen dioxide on hematological parameters was studied in vitro and in male and female Wistar rats. Concentrations of 10 and 20 ppm reduced the resistance of erythrocytes and caused a change in the glutamate-6-phosphate dehydrogenase activity in in vitro tests. Inhalation tests (5 ppm, 10 ppm, and 15 ppm for 2 hr, and 15 ppm for 12 hr) revealed concentration-dependent, significant reduction of the acid phosphatase, lactate dehydrogenase, and malate dehydrogenase activities. The serum protein levels ranged from 7.5 g% (exposure to 5 ppm over 2 hr) to 6.8 g% (exposure to 15 ppm for 12 hr), and the albumin-to-globulin ratios were in a range of 55-63%.

57371 **APTIC NO. 74736**

Kanagawa Prefectural Bureau of Countermeasures for Environmental Pollution (Japan), Station of Pest Control

STUDIES ON LOCAL EVALUATION OF AIR POLLUTION BY BIOLOGICAL INDEX. RESULTS OF INVESTIGATION IN 1973 FISCAL YEAR. *(Seibutsu shihyo ni yoru taikiosen no chiiki hyoka ni kansuru kenkyu, 1973). Text in Japanese. Kanagawa-ken Taiki Osen Chosa Kenkyu Hokoku. (Rep. Invest. Res. Air Pollut. Kanagawa Prefect.), no. 17:103-108, Feb. 1975. 14 refs.*

The general status of environmental pollution was examined, using an ecological analysis of moths collected by 23 light traps throughout Kanagawa Prefecture during 6 mo from May 1973. The total number of moths collected was 9464, with more than 400 species being identified. The index of diversity obtained by Brillouin s formula (base two logarithm) was higher in western than in eastern parts of the prefecture. It was especially lower in suburban and congested residential areas. The distribution of the index of diversity of moths generally corresponded very well with the overall status of the environment. The index appears to be useful for local evaluations of the environment, including air pollution assessments.

57372 **APTIC NO. 81259**

Osaka Prefectural Government

SURVEY ON EFFECT OF AIR POLLUTION ON HEALTH OF THE INHABITANTS IN OSAKA. *(Taikiosen ni yoru jumin no kenko eikyo chosa). Text in Japanese. In: 1975 Environmental Pollution White Paper, p. 265-267, Oct. 1975.*

The results of a health examination focusing on the morbidity of chronic bronchitis among city dwellers older than 40 are reported. The results for Toyonaka City (1970-1972), Takaishi City (1970-1972), Suita City (1971-1973), and Moriguchi City (1971-1974) were 12.3, 8.3, 7.9 and 6.5% in men and 6.5, 4.3, 3.5 and 2.8% in women, respectively.

57373 **APTIC NO. 81322**

Tokyo Metropolitan Research Inst. for Environmental Protection

LATENT EFFECTS OF AIR POLLUTION ON HUMAN BODY, ESPECIALLY THEIR RELATIONSHIP TO CHRONIC OBSTRUCTIVE PULMONARY DISEASES. *Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot., vol. 1975:63-73, 1975. ABSTRACT*

Surveys were conducted to study the effect of air pollution on the health of residents. An area adjacent to a factory was compared with an area which has no fixed sources of pollution nearby. A questionnaire and clinical and X-ray chest examinations were used. Peak flow, forced expiratory volume, and vital capacity were determined in a pulmonary function test. Immunoserological examinations designed to study host factors were carried out to determine the total protein content in the serum and the quantities of immunoglobulins. Nasopharyngolaryngological examination was carried out to check the upper airway. The continuous phonation time and the respiratory expenditure index were measured by sonargrams. Delta aminolevulinic acid dehydrase and lead were measured in the blood and delta aminolevulinic acid (ALA), hematocrite and the sulfhydryl radical in the urine. Symptoms indicative of any meaningful regional difference were not observed during the interviews and physical examinations carried out in the two areas. This is probably due partly to differences in the composition of examinees selected. No significant difference was observed between the two areas with respect to percent capacity, peak flow rate, and respiratory impedance. However, the fact that obstructive ventilatory impairments were observed only in the polluted area seems to suggest some relationship to air pollution. Hematocrite measurements indicated that air pollution in the two areas had no conspicuous effect on the health of the residents. The ALA values in the urine were invariably in the normal range. Air pollution appeared not to cause any disease with specific symptoms. (Author abstract modified)

57374 **APTIC NO. 81723**

Tokyo Metropolitan Government Public Health Bureau (Japan)

SURVEY RESULTS ON SELF-PERCEIVED SYMPTOMS REDUCED IN HEALTH DIARIES OF SCHOOLCHILDREN. *(Kenko nikki ni yoru gakudo no jikaku shojo chosa kekka). Text in Japanese. 38p., March 1975.*

From May 1972 to July 193, 113 schoolchildren (4th graders at the start of the survey; 50 boys, 63 girls) at Arai Elementary School, Tokyo, answered questionnaires daily on the state of their health, including occurrence of headaches; eye, nose, and throat irritations; respiratory disorders; and time of occurrence of symptoms. The children also indicated whether they had colds at the time they filled out the qestionnaires. More girls than boys complained of symptoms. Nasal irritations were most frequently recorded, especially in winter. There was a constant 5% complaint about headaches. The largest number of symptoms were recorded at the beginning of the survey (May 1972) and at the start of the new term (April 1973). No correlation to oxidant concentrations at those times were found. It was concluded that in this survey, self-perceived symptoms of schoolchildren were unreliable indicators of environmental factors.

57375 **APTIC NO. 81724**

Tokyo Metropolitan Government Public Health Bureau (Japan)

REPORT OF SURVEY RESULTS ON THE EFFECTS OF CHANGES IN ENVIRONMENTAL FACTORS ON THE HEALTH OF SCHOOLCHILDREN. *(Kankyo inshi no hendo ga gakudo no kenko ni oyobosu eikyo chosa kekka hokokusho). Text in Japanese. 143p., March 1975.*

Of 113 schoolchilren (4th graders at start of survey; Arai Elementary School, Tokyo), participating in a survey on the effects of environmental factors on the body, 10 boys and 10 girls without respiratory ailments were chosen for lung function tests. Weekly tests were conducted from June 1972 to December 1973. Changes in the lower air passages (Vmax (maximum amount of respiratory flow), based on 25% and 50% FVC (forced vital capacity)) and the upper air passages (raw airway resistance and specific airway conductance, determined by body plethysmograph) were measured and correlated with environmental factors (hourly average values). With temperature rise, both upper and lower air passages were affected by ozone, nitrogen dioxide, nitrogen oxides, sulfur dioxide, and airborne particulate matter. At usual temperatures, ozone affected the upper air passages, while lower air passages were affected by the other four pollutants. Increased constriction of the air passages occurred with increased physical activity, when pollutants were present. As temperature rises, even during winter, constriction occurs, due to effects of environmental pollutants.

1974

57376 **APTIC NO. 73113**

Chattopadhyay, Amares and R. E. Jervis

HAIR AS AN INDICATOR OF MULTIELEMENT EXPOSURE OF POPULATION GROUPS. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 31-38. 15 refs. (June 11-13.)*

Scalp hair samples from residents of rural areas, urban control areas, and urban locations near secondary lead smelting operations and petroleum refineries were comparatively analyzed for 14 trace elements. Residents living near refinery and smelting operations showed elevated levels of arsenic, cadmium, lead, mercury, and antimony that amounted to 1.9, 4.1, 45.3, 2.3, and 14.6 ppm (median) as compared with urban control levels of 0.75, 2.0, 15.3, 2.0, 9.7 ppm, respectively, and rural levels of 0.68, 1.2, 9.1, 1.2, and 7.9 ppm respectively. Fair correlations existed between hair lead levels and blood lead levels, though hair concentrations extended over a much greater range (10-750 ppm) than blood concentrations (10-90 micrograms/100 ml). Children residing close to smelters, especially boys, showed the most elevated air lead levels, some ranging up to 10 times the normal value.

57377 **APTIC NO. 74149**

Chretien, J., H. Amadei, N. Donat, R. Lagrue, and J.-C. Saltiel

INDOOR AIR POLLUTION. *(La pollution aerienne dans la maison). Text in French. Rev. Prat., 24(29):2655-2663, May 1974. 12 refs.*

Sources and health hazards of indoor air pollution are reviewed. Domestic heating and smoking are the major sources of indoor air pollution. Air conditioners and humidifiers may emit allergenic microorganisms. Impregnated wood and paint may emit allergenic and toxic substances. Cosmetic, household, and drug sprays are responsible for sensitizing and toxic aerosols that may penetrate into the lower respiratory tract. Certain aerosols become respirable first after size reduction in glowing cigarettes. Exposed asbestos insulations represent a real cancer risk. Animals and their residues may cause infections or allergy. Aerosol and dust particles carry toxic gases, such as sulfur dioxide and nitrogen dioxide, into the lungs.

57378 **APTIC NO. 81044**

Cuddihy, Richard G., Russell P. Hall, and William C. Griffith

INHALATION EXPOSURES TO BARIUM AEROSOLS: PHYSICAL, CHEMICAL AND MATHEMATICAL ANALYSIS. *Health Phys., vol. 26:405-416, May 1974. 33 refs.*

A general biomathematical model for describing tissue retention patterns for inhaled barium aerosols was developed and applied to studies in which beagle dogs inhaled barium chloride, barium sulfate, heat treated barium sulfate, or barium in fused montmorillonite clay. Groups of three dogs that inhaled each form of aerosol were studied for respiratory tract retention of the radioactive label Ba133 for 6 days. An additional group of three dogs exposed to Ba133 labeled fused clay aerosols was studied for 512 days after inhalation. Aerosol particle size was used to predict the initial respiratory tract distribution of deposited aerosol, and in vitro chemical dissolution of aerosol samples was used to predict rates of respiratory tract clearance via systemic absorption. Solutions of the model system were then used to predict skeletal accumulation and urinary and fecal excretion of Ba133, which were compared with actual measurements for each experimental group. Reasonable agreement between predicted and observed whole body, tissue, and excreted Ba133 was observed over clearance rates which ranged in half times from hours for 133BaCl2 to hundred of days for Ba133 in fused clay. Results indicate that such kinetic models can be useful for the analyses of inhalation exposures to airborne toxicant. (Author abstract)

57379 **APTIC NO. 78349**

Deloff, Leonard

THE EFFECT OF AIR POLLUTANTS ON HUMAN HEALTH AND RELATED MEDICAL POSTULATES. *(Wplyw zanieczyszczen powietrza na adrowie ludzkie i zwiazane z tym postulaty lekarskie). Text in Polish. Gruzlica Choroby Pluc, 42(9):843-849, Sept. 1974. 12 refs.*

Major sources of air pollution in Poland are industry (25% contributed by power generating plants), residential heating by coal, and automobile exhausts which are still a relatively insignificant factor. In 1971 these sources generated 4.5 million tons of dust and 3 million tons of gaseous pollutants. Although fly ash is effectively removed by electrofilters, there are no adequate means for desulfurization and neutralization of sulfur and nitrogen oxides. In 1971 in the most polluted regions (Cracow, Katowice, and Lodz) in 65-99% of the cases the yearly accumulation of solid pollutants was three times higher than that allowed by the 1966 Antipollution Law, while concentration of sulfur dioxide was almost 100% higher. In 1968, one third of all inhabitants of Lodz were exposed to pollution that could cause chronic lung disease. High air pollution impairs natural defense mechanisms of the body (bronchial fluid system and phagocytosis in infundibulae). Depending on the size of particles inhaled, they can cause chronic bronchitis, emphysema or destructive emphysema. Vulnerability to pneumonia and lung cancer is increased. Surveillance of chronic bronchitis and emphysema started in Cracow in 1965 and in Zabrze in 1970. Results obtained in Zabrze showed chronic lung disease in 8% of those examined in the age bracket from 20-39 yr and 26% for ages 40-64. Results for Cracow were 11-19% and 14-27%, respectively. Total work disability due to chronic lung disease reached 5-10% in Zabrze. Absenteeism due to chronic lung disease in Poland was 9% in 1960 and 15% in 1971.

57380 **APTIC NO. 78396**

Ghelberg, N. W. and Ecaterina Bodor

HAIR LEAD AS A TEST FOR HUMAN BODY LEAD IMPREGNATION. *(Plumbul din par, ca test al impregnarii organismului). Text in Rumanian. Igiena (Bucharest). 23(8):463-469, 1974. 18 refs.*

The amount of lead in distal parts of the hair was evaluated using a photometric method with dithisone. A total of 207 children and adults are classified according to the intensity of Pb pollution of the environment produced by a non-ferrous metallurgy plant. A positive relationship is determined between the amount of Pb in the har and that in the environment. The following results are obtained in ppm: controls (children): 11.62 + or - 8.22; polluted center subjects 71.77 + or - 71.60; male adult controls 19.87 + or - 14.38; subjects from the new section of the polluted center 39.30 + or - 24.74; subjects from the industrial section of the center 64.76 + or - 48.34; and in workers with professional Pb exposure the values are 179.09 + or - 212.99.

57381 **APTIC NO. 71563**

Hackney, Jack D.

RELATIONSHIP BETWEEN AIR POLLUTION AND CARDIOVASCULAR DISEASE. *Preprint, American Medical Assoc., Chicago, Ill., 31p., 1974. 76 refs. (Presented at the Air Pollution Medical Research Conference, San Francisco, Calif., Dec. 5-6, 1974.)*

Toxicological experiments with humans and animals and epidemiological studies are reviewed concerning the relationship between air pollution and cardiovascular disease, with particular emphasis on carbon monoxide exposure. Exposure to high CO levels impairs the function of the heart, brain, and exercising skeletal muscle, while controlled exposure to low concentrations of CO results in decreased exercise tolerance in patients with arteriosclerotic heart disease. Carboxyhemoglobin levels as low as 3% can have measurable effects on patients with angina pectoris. The extent to which CO from cigarette smoking contributes to adverse cardiovascular effects is not known. A review of the effects of other pollutants such as oxidants, sulfur oxides, and cadmium on cardiovascular disease indicates that these also may adversely affect the cardiovascular system, though the evidence is limited.

57382 **APTIC NO. 81231**

Holland, W. W.

EPIDEMIOLOGY OF CHRONIC BRONCHITIS. *(L epidemiologie de la bronchite chronique). Text in French. Marseille Med., 111(11):509-519, 1974. 18 refs.*

The results of British studies relating the etiology of chronic bronchitis to geographical differences are discussed. Death and sickness resulting from chronic bronchitis are more common among men than women, and morbidity increases with age. Several studies done on the relationship between chronic bronchitis and smog showed a close agreement between the percentages of mortality due to chronic bronchitis and air pollution. Two methods of studying the geographical variations of chronic bronchitis are discussed: 1) examination of groups in different regions and 2) examination of large groups of people with the same occupation in different regions. A questionnaire was prepared by the Medical Research Council in 1966 to study chronic bronchitis. It includes questions about respiratory symptoms, smoking habits, and profession. Following response to the questionnaire, subjects respiratory functions were tested. Results of a study of schoolchildren in Kent (England) in 1969 using this questionnaire showed that thoracic expiratory capacity varied with age, height and weight of the child. None of the factors studied (place, social class, relatives with respiratory illness, and number of children in family) had an effect greater than a combination of factors. All of the respiratory symptoms (cough, phlegm, chronic bronchitis, pneumonia) were more frequent among smokers. It was concluded that in order to prevent chronic bronchitis, it is necessary to reduce air pollution, and to prevent children from smoking.

57383 **APTIC NO. 81050**

Jech, J. and Z. Uhl

SOME EXPERIENCE ON THE HYGIENIC IMPORTANCE OF EXPOSURE TO CARBON MONOXIDE IN THE TOWN ENVIRONMENT. *(Nektere poznatky o hygienickem vyznamu expozice kyslicniku uhelnatemu v mestskem ovzdusi). Text in Czech. Cesk. Hyg., 19(10):470-474, 1974. 11 refs.*

The increase of the level of carboxyhemoglobin in the blood of persons spending time in a street of Prague with heavy traffic (about 1000 cars/hr, 10-20 mg carbon monoxide/cu m) was studied. In a group of eight non-smokers, a 2-hour stay in the street increased the level of CO in the expired air by 3 mg CO/cu m (0.6-6 mg/cu m). The increase after a 4-hour stay was 4 mg CO/cu m (1.2-6 mg/cu m. It corresponded to the increase of carboxyhemoglobin in blood within about 2%. The increase of carboxyhemoglobin content was dependent on the concentration of CO in the air.

57384 **APTIC NO. 74822**

Kimura, I., H. Shioi, S. Suda, T. Yoshida, Y. Sato, N. Konno, S. Sakurai, and H. Tsunoda

ON THE EFFECTS OF ENVIRONMENTAL POLLUTION BY AIRBORNE FLUORIDES ON EXPERIMENTAL GOATS (IV). RESULTS OF 2-YEAR CLINICAL EXAMINATIONS. *(Taikichu fukkabutsu no kankyo osen ni yoru yagi no bakuro jikken (Dai-4-ho). 2-Nenkan no rinsho kensa seiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution) 9(2):347, Nov. 1974. (Presented at the Japan Society of Air Pollution, National Meeting, 15th, Paper 202.)*

The biological effects of atmospheric fluoride pollution were investigated with seven goats raised for 2 yr (1972-1974) in an area exposed to pollution from an aluminum refinery. A control group of 4 goats was raised in a non-polluted area during the same time. Average fluorine content of pasture grasses in the pollution area was 30 ppm, 4 times as high as that in the control area. The monthly average atmospheric hydrogen fluoride concentrations during the 2 yr ranged from 0.4-1.4 micrograms/cu m. The average monthly serum fluorine concentrations in the exposed goats varied from 0.1 ppm to 0.4 ppm. The average monthly urinary fluorine concentrations for exposed goats ranged from 7 ppm to about 15 ppm. Control goats had a steady serum fluorine level of about 0.05 ppm, and urinary fluorine concentrations between 0-4 ppm. Blood tests were also taken for hematocrit; hemoglobin, protein, cholesterol, BUN, ZTT, GOT, Al-P. In general, no significant variations were found between plots for exposed and control goats, although exposed goats had higher levels of GOT, and the plots did not coincide well for cholesterol concentrations.

57385 **APTIC NO. 73120**

Lagerwerff, J. V. and D. L. Brower

EFFECT OF A SMELTER ON THE AGRICULTURAL CONDITIONS IN THE SURROUNDING ENVIRONMENT. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 203-212. 32 refs. (June 11-13.)*

Samples of human blood and hair, animal blood, milk, home-produced vegetables, and house dust were obtained from areas exposed to smelter fall out and were analyzed for lead, zinc, and cadmium. Lead and Cd intakes for persons living under high exposure conditions, i.e., within 2 km of the smelter, appear to be about 50% greater than normal for each metal. The Pb content of home produce, milk, and human and animal blood was significantly higher than normal in high fallout areas; cadmium followed a similar trend for produce and house dust. (Author abstract modified)

57386 **APTIC NO. 81329**

Lesch, R., C. Mittermayer, and T. Mochizuki

MORPHOLOGICAL ASPECTS OF THE ENVIRONMENTAL STRESS OF THE LUNGS WITH SPECIAL REGARD TO LESIONS OF THE ALVEOLAR NETWORK. *(Morphologische Aspekte der Umweltbelastung der Lunge unter besonderer Beruecksichtigung der Schaedigungen des Lungengeruestes). Text in German. Praxis Pneumol., vol. 28:757-771, 1974. 36 refs.*

The lungs and the rest of the organism by way of the lungs are affected by many exogenous factors, such as inorganic and organic dust, bacteria and viruses and molds, carcinogenic and non-carcinogenic chemicals, and ionizing and heat radiation. The effects of these factors on the lungs - whether inhaled or reaching the lungs by way of the circulatory system - are discussed, from bronchial carcinoma and panbronchiolitis in chemical warfare workers to fibrosis in a mechanic and even to pulmonary insufficiency caused by drugs. Also, many toxic compounds, such as chloroform and carbon tetrachloride, can reach the liver first entering the body through the lungs.

57387 **APTIC NO. 72961**

MacEwen, J. D. and E. H. Vernot

TOXIC HAZARDS RESEARCH UNIT ANNUAL TECHNICAL REPORT: 1974 (FINAL REPORT). *California Univ. at Irvine, Dayton, Ohio, Overlook Branch, Air Force Contract F33615-73-C-4059, Proj. 6302, Task 01 13 62202F Work Unit 6302113, Rept. AMRL-TR-74-78, 200p., July 1974. 55 refs.*

GPO

Acute and chronic inhalation toxicity studies of various compounds of interest to the Air Force were performed using several types of laboratory animals. The studies included: the mammalian toxicity of fluomine dust (cobalt-bis (3-fluorosalicylaldehyde)-ethylenediimine), the chronic toxicity of JP-4 jet fuel, the acute toxicity of cluster marker residue (burned misch metal), coal tar aerosol studies, the acute toxicity of various amine compounds, benzonitrile toxicity, the biological effect of continuous inhalation exposure to 1,1,1,-trichloroethane (methyl chloroform), the toxicity of the photographic compounds triphenyl stibine and 1,1-bis (p-dimethylaminophyenyl)-ethylene, the effects of 6-month chronic low level inhalation exposures to hydrazine, the acute toxicity of deuterium fluoride, and determination of a 60 minute median lethal concentration for hydrogen chloride on rodents.

57388 **APTIC NO. 78153**

Sasai, A.

STUDIES ON THE RELATIONSHIP BETWEEN THE CONTENT OF CARBON MONOXIDE IN ATMOSPHERE AND THE HEALTH OF MOTHERS AND BABIES PART 2. RELATION BETWEEN CARBON MONOXIDE CONTENT OF PREGNANT WOMAN S EXPIRED AIR AND GESTATION, PARTURITION AND NEONATAL GROWTH. *(Tai-chu issankatanso (CO) nodo to boshi no kenko to no kanren ni kansuru kenkyu Dai 2-ho. Nin-sanpu no koki-chu CO-nodo to ninshin, bunben oyobi shusseiji no hatsuiku to no kanren). Text in Japanese. Minzoku Eisei (Human Hyg.), 40(2):61-84, March 1974. 16 refs.*

The interrelationship between the relatively low carbon monoxide concentration in the environment and gestation, parturition, and neonatal growth was investigated in 165 women and their offspring. The women were examined 1 to 2 and 3 to 4 mo post parturition at three health centers in Tokyo. The incidence of substandard birth weight (less than M-1/2 sigma determined according to weeks of gestation) differs significantly among the three health centers. Children with substandard birth weights are more frequent from mothers with higher CO levels in expired air, as compared to children with higher CO levels in expired air, as compared to children with standards or greater birth weights. Children 3-4 mo old have a lower body weight in inverse correlation to the mother s CO level in expired air. There is a higher incidence of babies with abnormalities in The Koishikawa Health Center area with the highest environmental CO concentrations. Mothers with greater CO concentration in expired air show higher hemoglobin levels at 3-4 mo post parturition.

57389 **APTIC NO. 7[illegible]796**

Ueshima, I., M. Tsuda, H. Kono, T. Okumura, and Y. Tsunetoshi

ON THE RELATIONSHIP BETWEEN COMPLAINTS OF SYMPTOMS AND AIR CONDITIONS. *(Shojo no uttae to taiki joken tono kankei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):315, Nov. 1974.*

The daily variation of complaints of subjective symptom due to photochemical smogs were investigated in the diaries of patients children. On the occasion of photochemical smog on Oct. 2, 1973 with oxidant concentration of more than 0.15 ppm, the frequency of complaint of respiratory irritating symptoms such as sneeze, cough, and pain in the throat was generally high as were the complaints of headache in non-allergic and non OD children. Complaints of sneeze increased suddenly on Oct. 2 and 3, then decreased; pain in throat and cough increased after Oct. 2; and complaints of headache increased on Oct. 2, and 3. No complaint of eye-irritation was noted.

57390 **APTIC NO. 78684**

Yagura, T.

EXPERIMENTAL ANIMAL MODELS FOR HUMAN BRONCHIAL ASTHMA. *(Jikkenteki Kikanshi Zensoku* *to hito no zensoku). Text in Japanese. Rinsho Meneki (Clin. Immunol.), 6(1):25-34, Jan. 1974. 45 refs.*

An experiment done with guinea pigs on allergic asthma by active sensitization with purified proteinaceous antigen, such as crystalline bacterial alpha-amylase (BA) of an average m.wt. of 50,000, obtained from Bacillus Subtilis and by passive sensitization with anti-BA serum from immunized guinea pigs by antigen (BA), and with the inhalation of antigen-BA is described. The immunological analysis of experimental allergic asthma due to active sensitization showed a decreased severity of asthmatic paroxysm with the increased number of provacations due to the blocking ability of 7-S-gamma 2 antibody opposing the provoking action of 7-S-gamma 1 antibody and the inability of provoking asthma when the ratio of values of both antigen was less than 8. The non-production of IgE antigen in guinea-pig s serum was observed. The mechanism of desensitization therapy, the change of respiratory function during the asthmatic paroxysm, and the histopathological findings on asthma are discussed.

57391 **APTIC NO. 74369**

Shizuoka Prefectural Office (Japan)

STATUS OF DAMAGES DUE TO ENVIRONMENTAL POLLUTION. SEC 1 STATUS OF HEALTH INJURIES IN FUJI DISTRICT AND ITS COUNTERMEASURES. SEC. 2. STATUS OF AGRICULTURAL CROP DAMAGE. *(Kogai ni yoru higai no jokyo. Dai 1-setsu. Fuji chiiki no kenkohigai no genkyo to taisaku. Dai 2-setsu Nosakumotsu higai no jokyo to taisaku). Text in Japanese. In: Shizuoka Prefectural Environmental Nuisance White Paper, p. 254-260, 1974.*

The rapid expansion of paper factories in the Fuji district of Shizuoka Prefecture resulted in increased air pollution leading to health injuries such as chronic bronchitis. The number of officially recognized air pollution patients was 360 by the end of March 1973 and 469 by the end of March 1974, including seven mortalities. The percentage of chronic bronchitis, bronchial asthma, asthmatic bronchitis, and pulmonary emphysema cases were, respectively, 6.4, 85.1, 5.5, and 3.0%. The number of such patients outside the appointed jurisdiction was 173 by the end of March 1974. Patients younger than 14 and older than 60 yr accounted for 78% of the total cases. Countermeasures included medical compensation. Agricultural crop damage was due to photochemical smog (covering 12,000 hectares) acidic rainfall, and hydrogen fluoride emissions from an aluminum refinery.

57392 **APTIC NO. 74711**

PRESENT STATUS OF CERTIFICATION OF AIR POLLUTION VICTIMS WITH HEALTH IMPAIRMENT, TABULATED BY DISEASE AND MUNICIPALITY. *(Taiki osen kenko shogaisha nintei jokyo, shitsubyo betsu, kushichoson betsu). Text in Japanese. Tokyo-to Eisei Nenpo (Annual Report of Public Health, Tokyo), no. 26:259, 1974.*

A list of the muncipalities in Metropolitan Tokyo, the number of subjects (0-17 years old) examined from each area, the number of patients from this group who were certified as pollution victims, and types of respiratory diseases which they had. A total of 2,920,503 subjects were examined, 13,959 of whom had one of four kinds of respiratory diseases. There were 219 cases of chronic bronchitis, 8682 cases of bronchial asthma, 5057 cases of asthmatic bronchitis, and 1 case of emphysema. More than half of these cases were found in Tokyo. In the Ota Ward in Tokyo City there were 771 cases of bronchial asthma and 746 cases of asthmatic bronchitis. In the Setagaya Ward in Tokyo City there were 665 cases of bronchial asthma and 391 cases of asthmatic bronchitis.

57393 **APTIC NO. 74793**

Kanagawa Prefectural Office (Japan)

PRESENT STATE OF DAMAGE DUE TO PHOTOCHEMICAL SMOG. *(Kokagaku kogai no jokyo). Text in Japanese. In: Kanagawa Prefectural Public Nuisance White Paper, 1974. p. 127-138, Dec. 1974.*

The date, duration, area and concentration of photochemical smog (oxidant) alarms officially issued by the Kanawaga Prefectural Office were tabulated, with the frequencies being two, one, two, 11, 10 and four, respectively, in April, May, June, July, August, and September of 1973. The total number of alarms were 11, 31 and 30, respectively, in 1971, 1972 and 1973. The number of patients due to photochemical smog were 2526 in 1973, including 1509, 435, and 393, respectively, in Yokohama, Ayase and Kawasaki. The patients were concentrated into narrow subareas such as Tsurumi, Nishi, Hodogaya, Tama, Saiwai, and Kawasaki Wards. The time of day when injury occurred was limited to 0900-1630 hr, and the day of illness coincided with the day when the alarm was announced. About 84.9% of the patients were children who had been doing physical exercise. Their symptoms were quite similar to those of Tokyo smog patients; however, they were all transient and did not require hospitalization.

1973

57394 **APTIC NO. 81041**

Cralley, Lewis J. and William S. Lainhart

ARE TRACE METALS ASSOCIATED WITH ASBESTOS FIBERS RESPONSIBLE FOR THE BIOLOGIC EFFECTS ATTRIBUTED TO ASBESTOS? *J. Occup. Med., 15(3):262-266, March 1973. 29 refs.*

The role of trace metals associated with asbestos in the biologic response to asbestos is considered. None of the theories proposed to account for the fibrogenic response to asbestos is adequate to explain the pathologic mechanisms of asbestosis. The asbestos fiber may be a cocarcinogen or may serve largely as a mechanical carrier of other agents to tissue sites. Asbestos fibers in the body tissues give rise to asbestos bodies. Characterizing the trace metals in asbestos is difficult because great variation exists in the specific metals present in the original mineral and in the airborne concentration. There is no definitive evidence that relates the fibrogenic properties of asbestos fibers or their potential to form asbestos bodies to trace metals associated with the fibers. Bits of evidence are available, however, which could explain how the presence of trace metals may play a modifying role in these biologic responses to asbestos. A considerable body of evidence exists relating trace metal contents associated with asbestos fibers with the carcinogenicity of asbestos. Evidence is presented supporting the hypothesis that the electromotive interactions of the metals and minerals present are important determinants of the carcinogenic action of asbestos. (Author abstract modified)

57395 **APTIC NO. 74623**

Ghelberg, N. W. and M. Deleanu

ASPECTS OF URBAN ATMOSPHERIC POLLUTION AND THE ROLE OF LEAD. *(Aspecte ale poluarii atmosferei urbane si locul ocupat de plumb in cadrul acesteia). Text in Romanian. Rev. Med. Chir. Soc. Medici Nat. Iasi, vol. 77:507-512, July-Sept. 1973. 11 refs.*

Urban air pollution is discussed, with particular emphasis on lead. Topics covered include: effects on the microclimate, buildings, vegetation, animals, and humans; the role of dust, sulfur dioxide, solar radiation, oxidants, air ionization and condensation nuclei; and research data from two industrial centers in Romania, Turda and Baia Mare. Dust is the major pollutant in Turda, a center for building materials and the chemical industry. Baia Mare is a chemical and metallurgical center where lead is the major pollutant. Disease incidence was more frequent at Turda as compared to control cities, 14.8

times more for chronic bronchitis in adults, 2.5 times more for cardiovascular diseases, 2.5 times higher for gastric and duodenal ulcers, 2.4 times higher for respiratory diseases in children, and 3.1 times higher for cardiovascular diseases. At Baia Mare, the incidence of chronic bronchitis was 7.6 times higher than control cities, 5.7 times higher for gastric and duodenal ulcers, 3.5 times more for blood and hematopoietic diseases, 3.4 times more for cardiovascular diseases, 6.3 times more for childhood blood diseases, and 3.7 times more for rickets, and 3.2 times more for respiratory diseases. Industrial lead reaches larger areas than traffic lead, though the concentration is highest in the plant's vicinity. Research is needed to determine the contact and intensity of exposure and specific effects. Provoked plumburia tests proved very useful.

57396

APTIC NO. 78594

Henry, M. C., C. Aranyi, and R. Ehrlich

SCANNING ELECTRON MICROSCOPY OBSERVATIONS OF THE EFFECTS OF ATMOSPHERIC POLLUTANTS AND INFECTIOUS AGENT. *Aerobiol., Airborne Transm. Airborne Infect., Proc. 6th Intern. Symp., Enschede, Netherlands, 1973 (?), p. 216-219. 4 refs.*

Morphological changes in the bronchi of hamsters exposed to various combinations of nitrogen dioxide, tobacco smoke, and infectious challenge were studied with scanning electron microscopy. The following experimental conditions were used: two acute 2-hour exposures to 15 ppm NO2, three acute 1-hour exposures to 3% (by volume) of tobacco smoke and non-filter cigarettes, four acute 2-hour exposures to 15 ppm NO2 followed by a 1-hour exposure to 3% tobacco smoke, and challenge to airborne K pneumoniae within 1 hr after exposure to the pollutants. A control group was also exposed to the infectious agent. No morphological changes in the bronchi were observed after exposure to the infectious agent by itself. Exposure to NO2 resulted in only slight changes in the surface structure of the respiratory airways. Exposure to tobacco smoke and to the bacteria produced alterations in the surface structure apparent 2 days after exposure; however, the damage was reversible at 7 days after the exposure. Exposure to both pollutants followed by infectious challenge produced marked loss of cilia and alteration of the surface morphology of non-ciliated cells 2 days after exposure. These changes were not reversible, and the surface structure of the bronchi showed an even greater disruption at 7 days after exposure.

57397

APTIC NO. 75392

Lukashev, A. A.

MECHANISM UNDERLYING THE TOXIC ACTION OF MOLYBDENUM IN THE ANIMAL ORGANISM AND THE EFFECT OF SULFATE-ION ON THE COURSE OF MOLYBDENUM POISONING. *(Mekhanizm toxicheskovo deystvia molybdena v zhivotnom organizme i vliyaniye sul fat-iona na techeniye intoksikatsii molibdenom). Gigiena Truda i Prof. Zabolevaniya, no. 12:13-17, 1973. 15 refs. Translated from Russian, 8p.*

Observations of occupational molybdenum poisoning and toxicological experiments with laboratory animals are reported, with particular emphasis on the mechanism of toxicity and the therapeutic effectt of oral sulfate administration. Although molybdenum upon entering the body as molybdate is excreted fairly quickly in the urine, it does nevertheless inhibit the activity of sulfidoxidase which in turn results in the accumulation of sulfide and the formation of thiomolybdate in tissues. Thus the toxic effects of molybdate appear to be due to the formation of the highly toxic thiomolybdate. Peroral administration of sulfate ion in drinking water results in conditions favorable for the oxidation of thiomolybdate to molybdate, with the latter being then eliminated in the urine. A rise in sulfidoxidase following sulfate administration appears to proceed after a de nodo type synthesis.

57398

APTIC NO. 81369

Mittman, Charles, Teevee Barbela, and Jack Liberman

ALPHA 1-ANTITRYPSIN DEFICIENCY AS AN INDICATOR OF SUSCEPTIBILITY TO PULMONARY DISEASE. *J. Occup. Med., 15(1):33-38, Jan. 1973. 25 refs. (Presented at the American Industrial Hygiene Conference, San Francisco, Calif., May 18, 1972.)*

Of the more than 20 alpha 1-antitrypsin (A1AT) phenotypes that have been described, the rare ZZ type is associated with a severe deficiency of serum A1AT and predisposes to the development of chronic obstructive lung disease (COLD). Several phenotypes, including the MZ, SS, and MS, occur in up to 10% of individuals in normal populations and are associated with an intermediate A1AT deficiency. These phenotypes occurred more frequently than expected in a group of 170 patients with COLD, indicating that the intermediate deficiency also predisposes to COLD. The spectra of clinical and physiological findings are similar in patients with both levels of deficiency, bbut those with the intermediate deficiency develop overt disease later in life and after more intense and prolonged exposure to cigarette smoke and other environmental irritants. Pulmonary function studies in 144 presumably healthy subjects with the intermediate deficiency show evidence of anatomic emphysema, and early but definite obstructive changes occur in over a third of those who smoke. The A1AT deficiency predisposes to the development of anatomic epmhysema. When the anatomic change is severe or is associated with exposure to environmental irritants, overt disease develops. Since COLD in A1AT deficiency is the result of the interaction of genetic and environmental factors, it is potentially preventable. (Author abstract)

57399

APTIC NO. 81302

Nieding, G. von, H. Krekeler, R. Fuchs, M. Wagner, and K. Koppenhagen

STUDIES OF THE ACUTE EFFECTS OF NO2 ON LUNG FUNCTION: INFLUENCE ON DIFFUSION, PERFUSION AND VENTILATION IN THE LUNGS. *Int. Arch. Arbeitsmed., 31(1):61-72, 1973. 26 refs.*

The acute effects of nitrogen dioxide on pulmonary function were studied in 55 healthy male subjects (18-65 yr old) and 84 male patients suffering from chronic bronchitis (30-72 yr old). A significant decrease in carbon monoxide diffusing capacity amounting to 3.8 ml/min-torr was observed in 16 healthy subjects inhaling 5 ppm NO2 over a period of 15 min. Prolongation of exposure to 5 ppm NO2 from 15 to 60 min did not result in disturbances of the respiratory gas exchange for oxygen in bronchitic patients beyond the extent of disturbance observed after exposure for 15 min. Increased airway resistance was related to the inhaled concentration of NO2 for concentrations up to 5 ppm, though no effect was apparent at concentrations less than 1.5 ppm. Lung perfusion studies with rabbits revealed that the inhalation of 30 ppm NO2 over 15 min results in a redistribution of perfusion, with reduced storage in the peripheral areas of the lungs being observed. The findings are discussed in relation to the possible causative association between NO2 exposure resulting from smoking and the inhalation of polluted air and the occurrence of chronic bronchitis and pulmonary emphysema.

57400

APTIC NO. 78490

Wada, Osamu, Tsuneyuki Nakajima, and Kohei Toyokawa

STABILITY OF DELTA-AMINOLEVULINIC ACID (ALA) DEHYDRASE (ALD-D) IN BLOOD SAMPLES AND OF DISSOLVED ALA AS SUBSTRATE FOR ASSAY OF ALA-D. *Ind. Health (Japan), vol. 11:75-76, 1973. 4 refs.*

The stabilities of delta-aminolevulinic acid dehydrase (ALA-D) and delta-aminolevulinic acid (ALA) substrate were investigated under different environmental conditions to assess the reliability of ALA-D measurements as an indicator of lead exposure. The enzyme was stable for at least 12 hr when stored at room temperature or temperatures of 4 C or -20 C.

The enzyme activity of blood samples after 24 hr decreased by 12% at room temperature, 7% at 4 C, and 3% at -20 C. A slight reduction in ALA-D activity was also observed when the ALA concentration of the substrate solution was decreased However, the reduction in activity was small in comparison with the reduction in ALA concentration.

57401 **APTIC NO. 78491**

Wada, Osamu, Yuzo Yano, Tetsu Ono, and Kohei Toyokawa

THE DIAGNOSIS OF DIFFERENT DEGREES OF LEAD ABSORPTION: IN SPECIAL REFERENCES TO CHOICE AND EVALUATION OF VARIOUS PARAMETERS INDICATIVE OF AN INCREASED LEAD ABSORPTION. *Ind. Health (Japan), 11(1 and 2):55-67, 1973. 44 refs.*

Clinical and biochemical criteria of lead exposure and intoxication were investigated among three groups of occupationally-exposed individuals (44 workers) and among two groups not occupationally exposed (40 inhabitants from an urban area and 39 from a rural area). Statistically significant differences between mean values of blood lead and delta-aminolevulinic acid dehydrase (ALA-D) were observed among all five groups. The three occupationally-exposed groups also showed significant differences for urinary lead, delta-aminolevulinic acid, (ALA) urinary coproporphyrin, and hemoglobin. Blood lead correlated negatively with ALA-D in all five groups and positively with urinary lead and ALA for the three occupational groups. Negative correlations were observed between ALA-D and measurements of urinary lead and ALA in the three occupational groups. Significant differences in values of blood lead and ALA-D were observed between urban and rural inhabitants not occupationally exposed to lead. Close negative correlations were observed between blood lead and ALA-D at these normal blood levels. Increased ALA excretions were observed when ALA-D activity was decreased to about 40% of its normal level. Blood lead and ALA were the parameters of choice for clinical assessment and heavy exposure cases. Slight exposure cases were better assessed with measurements of ALA-D. All of the parameters investigated were useful for comparing different levels of lead exposure among groups of subjects. Blood lead and ALA values of 65 micrograms/100 g and 17 mg/l, respectively, were almost always associated with symptoms and signs of lead poisoning. (Author abstract modified)

57402 **APTIC NO. 74297**

Nagoya Municipal Bureau of Environmental Protection (Japan)

RESULTS OF MEDICAL EXAMINATIONS OF PEOPLE UNDER THE INFLUENCE OF HEAVY METALS IN DUST FALL. - SURROUNDINGS OF A STEEL MILL.. *(Koka baijin-chu no jukinzoku ni yoru osen chiiki jumin no kenko chosa seiseki (Toshiwawa Seiko shuhen)). Text in Japanese. 5p., July 1973.*

Medical examinations were given to 253 inhabitants 97 male and 156 female living in the vicinity of a steel mill emitting dusts containing lead. No person was diagnosed as being lead intoxicated. Examinations carried out on 11 boys and 19 girls in primary school revealed average blood leads 20.1 and 17.0 micrograms/dl, respectively. Urinary lead values were 14.6 and 18.3 micrograms/dl, respectively. Both blood and urine levels of lead were higher than normal. Urino-coproporphyrin values in adults and in children were normal. However, urino-delta-amino- levulinic acid was higher than normal in children (3.1 in boys and 3.4 micrograms/l in girls). Hemogloblin levels in adults and children were normal.

57403 **APTIC NO. 76799**

Nagoya Municipal Bureau of Environmental Protection (Japan)

RESULTS OF MEDICAL EXAMINATION OF PEOPLES UNDER HEALTH SUPERVISION AMONG INHABITANTS IN THE POLLUTED AREA DUE TO HEAVY METALS IN DUST FALL. - SURROUNDINGS OF A STEEL MILL.. *(Koka baijin-chu no jikinzoku ni yoru osen chiiki jumin no kenko kanrisha no kenshin seiseki (Toshikawa Seiko shuhen)). Text in Japanese. Preprint, 6p., July 1973.*

Medical examinations were carried out since 1961 on seven women and 22 schoolchildren suffering from lead intoxication caused by heavy metals in dust fall from a steel mill nearby. Medical histories, hematological examinations and urinalyses were performed. Examinations in July 1972 and February 1973 showed that the blood lead level of the women and children was significantly reduced in 1973 as compared to 1972 (10.7 versus 17.6 micrograms/dl and 21.1 versus 26.9 micrograms/dl, respectively, for women and children). The lead content of the urine was also significantly reduced in the women (11.4 versus 25.7 micrograms/l), but it showed no significant change in the children (24.9 vs. 24.8 micrograms/l). The amount of urino-coproporphyrin and urine-delta-aminolevulinic acid showed a decreasing tendency in the women, and the former showed a decreasing tendency and the latter an increasing tendency in the chidlren. The amount of hemoglobin in the blood of the women and the children showed an increasing tendency. The number of women under health supervision was reduced from seven to one, and that of schoolchildren was reduced from 22 to 14.

1972

57404 **APTIC NO. 78607**

Ayres, Stephen M., Robert G. Evans, and Meta E. Buehler

AIR POLLUTION: A MAJOR PUBLIC HEALTH PROBLEM. *CRC Critical Rev. Clin. Lab. Sci., vol. 3, 1-40, Jan. 1972. 144 refs.*

Two types of smog are described: smog from coal burning and photochemical smog. The techniques used to measure carbon monoxide, sulfur, sulfur compounds, and particulates are described. Average values and seasonal variations in urban air are discussed. The concentration of pollutant material in the ambient air depends both on the absolute quantity of pollutants emitted into the air and the quantity removed by atmospheric cleansing. Failure of the normal cleansing mechanisms produces an atmosphere which has a high pollution potential. Characterization of the specific effects of urban air pollution on human health is based on evaluation of a series of toxicologic, physiologic, and epidemiologic studies. Epidemiologic studies of acute and chronic air pollution episodes are described. Episodic bronchospasm has dramatically increased in urban areas suggesting the causal role of infectious and pollutant agents rather than classical pollen allergy. Generally it has been impossible to reproduce human health effects in a laboratory environment in concentrations similar to those existing in polluted air. This discrepancy between toxicologic and epidemiologic study suggests that the total irritant potential of polluted air is related to a mixture of air contaminants and to associated unfavorable weather conditions such as low temperatures, high barometric pressures, and high humidity.

57405 **APTIC NO. 81183**

Imada, T., K. Kosuga, and M. Maehara

CONCENTRATION OF SULFUR DIOXIDE AND HEALTH IMPAIRMENT IN YAMATE AREA OF YOKOHAMA CITY. *(Yamate Chiku ni okeru SO2 nodo to kenko shogai). Text in Japanese. In: Training Report of the School of Public Health of Yokohama Municipal Univ., p. 109-117, 1972.*

The effects of sulfur dioxide on vital capacity one-second rate, and maximum expiratory volume ratio were studied by examination of 6th year primary schoolchildren in the Yamate area (1.0 mg SO3/100 sq cm/day) and in Seya Ward (0.3 mg SO3/100 sq cm/day). Vital capacity, one-second volume, and maximum expiratory flow varied with body height and sex: the taller children showing higher values and boys showing higher values than girls. In spite of minute differences, vital capacity ratios of both groups seemed almost equal. Generally, those in polluted area showed a higher value for one-second rate; however, those in 2 schools out of 3 schools in the polluted area showed lower values than those in less polluted schools; therefore, no conclusion could be reached on one-second rate. The maximum expiratory flow ratio was 91.1% in polluted areas and 94.1% in unpolluted areas. The difference suggest a reduction of maximum expiratory flow due to air pollution. Those now complaining of asthma showed lower values of vital capacity ratio, one-second rate, and maximum respiratory volume ratio.

57406 **APTIC NO. 76911**

Yokoyama, E.

COMPARISON OF THE RATE OF UPTAKE OF INHALED OZONE, NITROGEN DIOXIDE AND SULFUR DIOXIDE, IN UPPER AIRWAY. *(Kyunyu O3, NO2 oyobi SO2 no jokido ni yoru sesshuritsu no hikaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 7(2):192, Nov. 1972.*

An air flow was passed through the surgically isolated upper airway of anesthesized animals such as dog and rabbit at the rate of minute breathing capacity and at peak flow respectively. The air contained ozone, nitrogen dioxide at 4-41 ppm, and sulfur dioxide at 7-87 ppm. By determining the concentrations of the air pollutants at the inlet and the outlet of the isolated upper airway, the respective uptake rate of each air pollutant was calculated. The findings were: (1) the uptake rate of ozone via the nose was significantly larger than that via the mouth, the rate being inversely proportional to the ozone concentration via both routes except for high flow rate via mouth and the rate being inversely proportional to the flow rate in both routes; (2) the uptake rate of nitrogen dioxide was larger than that of sulfur dioxide in the range of the experiment, the average values being 42 and 94%, respectively; (3) when the air contained 22 ppm of 35S-sulfur dioxide at least 95% was taken up via the nasal route at the flow rate of 3.5 l/min; and (4) the uptake via the mouth route was also very high, however, the rate was reduced at the flow rate of 35 l/min.

1970

57407 **APTIC NO. 81266**

Klein, David H. and Edward D. Goldberg

MERCURY IN THE MARINE ENVIRONMENT. *Environ. Sci. Technol., 4(9):765-768, Sept. 1970. 17 refs.*

Mercury levels in coastal marine fauna were found to be 500 or more times greater than those in comparable volumes of seawater, assuming the living organisms contain 90% water by weight. Higher values of mercury were also found in sediments near sewer outfalls as compared to similar deposits further removed, implying man s influence on the distribution of mercury. A review of airborne mercury studies reveals mercury vapor concentrations over the San Francisco Bay area ranging from 0.5-25 ng/cu m of air in the winter and from 1-50 ng/cu m in the summer. High mercury levels always covary with high smog levels, indicating that human factors may govern its abundance.

EFFECTS-PLANTS AND LIVESTOCK

1976

57408 **APTIC NO. 81670**

Danbayashi, K. and Y. Tanaka

EFFECTS OF AIR POLLUTION ON TREES AND COUNTERMEASURES PART IV. STATE OF FORESTS OF PINUS THUNBERGII IN THE NEAR SUBURBS. *(Taikiosen no jumoku ni oyobosu eikyo to sono taisaku, IV, toshikinko kuromatsu hayashi no jittai). Text in Japanese. Hyogo Kenritsu Ringyo Shikenjo Kenkyu Hokoku (Rep. Res. Hyogo Pref. Forestry Exp. Stn.) no. 17:14-37, 1976. 7 refs.*

The effects of air pollution from the coastal industrial zone in the southern part of . .meji on Pinus thunbergii at 11 points within 30 km to the north-northeast (the major direction of the wind) were surveyed during 3 years since 1971. The effect on height was not clear; the effect on the diameter growth appeared at a critical point of about 0.3 mg of sulfur trioxide/100 sq cm. Although there were individual differences of sulfur content in the pine leaves, the last year s leaves contained more sulfur than the new leaves of this year. The sulfur content of total leaves compared to the sulfur trioxide content of air showed a steep linear curve until sulfur trioxide reached 0.3 mg/100 sq cm. These findings suggest that the critical point of air pollution is about 0.3 mg/100 sq cm. A study of withering by insects in non-polluted Fukuzaki showed no relationship between pine withering by insect pests and air pollution.

57409 **APTIC NO. 81552**

Ito, H.

PATTERNS OF TREE VIGOR BY COLOR INFRARED PHOTOGRAPH TAKEN ON GROUND. *(Sekigai color ni yoru jumoku katsuryoku no pattern ka, chijoshashin ni yoru kokoromi). Text in Japanese. Kankyo joho Kagaku (Environ. Inf. Sci.), 5(1):64-69, 1976. 7 refs.*

A simple method for measuring tree vigor by infrared photograph, sensitive to the near infrared region, is described. A chart by which tree vigor can be evaluated in terms of the color of the picture (bright red light corresponding to vigorous trees and blue corresponding to withered trees) is described.

57410 **APTIC NO. 81351**

Kanbayashi, H., C. Maeda, and M. Maeda

STUDIES ON THE SELECTION AND REARING OF RESISTANT INDIVIDUAL TREES AGAINST AIR POLLUTION PART 1. ON THE APPARENT RESISTANCE OF PINUS THUMBERGII. *(Taikiosen ni taisuru jumoku no teikoseikotai no senshutsu to ikusei ni kansuru kenkyu Part 1. Kuromatsu nomikakejo no teikosei). Text in Japanese. Hyogo Kenritsu Ringyo Shikenjo Kenkyu Hokoku (Rep. Res. Hyogo Pref. Forestry Exp. Stn.), no. 17:38-65, 1976. 7 refs.*

A program of selecting and rearing resistant individuals of tree species ranked as susceptible to air pollution involving exposure experiments and field plantings, and of utilizing strong strains for roadside trees, and weak ones as indicator plants, is described. The results for Pinus thunbergii are given. The resistant trees had dark green leaves with strong luster and with an obtuse apex, green to dark green in color. The susceptible trees had yellow to yellowish-green leaves without luster and with a sharp apex, brown to brownish-black in color. A tendency toward a higher sulfur content of leaves of susceptible trees, and lower content in resistant trees, was found. The trees were surveyed at 5 places in Hyogo Prefecture, all of which were polluted by factory exhaust and/or auto exhaust.

57411 **APTIC NO. 81671**

Yamazoe, F.

IDENTIFICATION AND JUDGEMENT OF PLANT DAMAGE DUE TO AIR POLLUTION. *(Taikiosen ni yoru shokubutus higai no kentei). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 12(1):27-35, 1976. 7 refs.*

Chemical analyses of plants damaged by air pollution, especially by sulfur dioxide and fluorine compounds to which plants are highly susceptible is described. The sulfur combustion method was preferred over gravimetric techniques involving addition of milk of lime. The water-soluble sulfur fraction was higher in plants acutely damaged by ambient sulfur dioxide, and in experimentally exposed plants. The extinction coefficient at 622 nm by the reaction of alizarin complexon reagent and fluorine in the presence of lanthanum ion was used to measure fluorine; the method of ionic electrode was preferred. An example of the analysis of plant damage due to dusts and smoke is given.

1975

57412
APTIC NO. 77421

Aizawa, E.

THE FLUORINE CONTENT OF AIR AND RICE GRAINS IN SEVERAL PARTS OF JAPAN. *(Honpo kakuchi ni okeru taikichu fussonodo to sanmai chu fussonodo ni tsuite). Text in Japanese. Iwate Igaku Zasshi (J. Iwate Med. Assoc.), 26(6):655-656, 1975.*

The concentration of fluorine was more than 1 microgram/cu m in the area around an aluminum refinery and a pottery factory, 0.1-0.5 microgram in larger cities, 0.1-0.3 microgram in local industrial cities, and undetectable (less than 0.05 microgram) in local commercial cities. In rice grains harvested in areas where the fluorine content of the air was more than 1 microgram/cu m, the fluorine content was significantly higher.

57413
APTIC NO. 74497

Baba, Y.

DWARFING AND ERADICATING OF PLANTS IN FIELDS DUE TO AIR POLLUTION. *(Taiki-osen ni yoru shokubutsu no waisei-ka to rachi-ka). Text in Japanese. Preprint, Japan Society for General Research, p. 62, 1975. (Presented at the Japan Society for General Research, Environmental Division Science Meeting, 1st, Tokyo, Japan, June 6-8, 1975.)*

Damage to vegetation in a field 3 km east to west and 0.25 km north to south of a metal refinery was investigated from 1970 to 1973. The vegetation consisted of Pinus densiflore, Quercus serata, and a species of Gramineae. The effect of air pollution due to refinery emissions was initially a reduction in the population of epiphytic lichens and then their eradication. Large branches of Cryptomeria japonica, Prunus yedoensis, and P. Lannesiana var. Lannesiana died, and rapid dwarfing of P.d., Q.s., and gramineae was observed, with the height of the grass being inversely quasi-proportional to the distance from the refinery. Death occurred in the order of P.d., the grass, and Miscanthus sinensis. Eventually, all of the vegetation in the field was destroyed.

57414
APTIC NO. 81600

Danbayashi, H. and Y. Tanaka

TESTS ON SELECTING AND REARING OF RESISTANT INDIVIDUAL TREES AGAINST AIR POLLUTION PART 1. SELECTION AND REARING EXPERIMENTS FOR RESISTANT INDIVIDUAL TREES OF PINUS THUNBERGII AGAINST AIR POLLUTION AND SALTY AIR. *(Taikiosen ni taisuru jumoku no teikosei kotai no senshutsu to ikusei shiken 1. Engai taikiosen ni taisuru teikosei kuromatsu no senshutsu to ikusei shiken). Text in Japanese. In: Hyogo Prefecture Forestry Experimental Station 1974. Annual Business Report, p. 33-34, 1975.*

Five resistant individuals of Pinus thunbergii from forests in a seaside part were planted in a test field in March 1974 along with a control pine seedling. After a year, the rooting, growth and injury of the plants were investigated. The percentage of rooting was over 90, and no difference of growth was recognized among the planted trees. No injury due to salty air or air pollution was identified.

57415
APTIC NO. 81601

Danbayashi, H.

TESTS ON SELECTING AND REARING OF RESISTANT INDIVIDUAL TREES AGAINST AIR POLLUTION PART 2. SELECTION AND REARING OF RESISTANT INDIVIDUAL TREES FOR TREE-PLANTING IN CITIES AND FACTORIES AGAINST AIR POLLUTION. *(Taikiosen ni taisuru jumoku no teikosei kotai no senshutsu to ikuseishiken 2. Ryokkaju no taikiosen ni taisuru teikosei no senshutsu to ikuseishiken). Text in Japanese. In: Hyogo Prefecture Forestry Experimental Station 1974. Annual Business Report, p. 34, 1975.*

The tree population in parks of Amagasaki City, including Selkova serrata, Ginkgo biloba, Acer polmatum, and Celtis sinensis, was studied to select resistant and susceptible individuals from the viewpoint of vigor, browning of leaves, amount of leaves, and growth. The resistant trees of these species numbered 4, 1, 1, and 1; the susceptible trees numbered 6, 1, 3 and 1, respectively. They will be grown by grafting and seeding.

57416
APTIC NO. 73911

Hatta, H.

CHARACTERISTICS OF PLANT dDAMAGE DUE TO OXIDANT AND THE USEFULNESS OF THIS DAMAGE AS AN INDICATOR OF OXIDANTS PART 3. SUBPART II: ACUTE INJURIES OF PLANTS DUE TO OXIDANT, SECOND REPORT. SUBPART III: EXAMINATION OF USEFULNESS OF THE DAMAGE OF PLANT AS OXIDANT INDICATOR. *(Oxidant ni yoru shokubutsu higai no tokucho to sono shihyosei (3)). II. Oxidant ni yoru shokubutsu no Kyusei higai III. Shokubutsu ni yoru oxidant shihyosei no kento. Text in Japanese. Nogyo oyobi Engei (Agr. Hort.), 50(4):503-506, April 1975. 54 refs.*

The relationship between plant damage due to oxidant and subsequent changes in the stomatal aperture and concentration of constituents of the leaves is discussed. The susceptibility of leaves to ozone is due to the opening, if any, of the stomata when ozone existed in air, and there is a relationship between the occurrence of injury and metabolism in thee leaf. The importance of environmental conditions and growth stage on the susceptibility of plant indicators to oxidant is discussed. The intervarietal susceptibility of petunia to peroxyacetyl is discussed with reference to assessing the concentration of PAN by using petunia plants with different toxic tolerances.

57417
APTIC NO. 74459

Hirose, H., T. Masui, S. Takagi, Y. Seto, M. Iwasaki, S. Ando, and T. Manabe

FLUORINE CONTENT OF ATMOSPHERE AND OF PLANTS AROUND AN ALUMINUM REFINERY. *(Alumi-seiren kojo shuhen ni okeru kankyo taiki to shokubutsu chu no fussoni tsuite). Text in Japanse. Shikoku Koshueisei Gakkai Zasshi (J. Shikoku Soc. Public Health), 20(1):92-94, Feb. 1975.*

Atmospheric fluorine levels at five points located 1 km, 1.5 km, 3 km, 4 km, and 5 km from an aluminum refinery were 22, 14, 20, 12 and 6 micrograms of F/sq m/ mo, respectively, in 1971; 67, 30, 38, 18 and 12 micrograms of F/sq m/mo, respectively, in 1972; and 46, 21, 28, 16, and 12 micrograms of F/ sq m/mo, respectively in 1973. The background fluorine level was 8-15 micrograms/sq m/mo before the refinery was in operation. Fluorine levels in leaves of pine trees at the five points showed increases fron August 1972 to May 1973 of from about 10-15 ppm to 30-55 ppm; however, no increase was observed from Aug 1973 to February 1974. The fluorine content of Artemisia princeps was very large (about 100 ppm) within 1 km of the refinery and became rapidly smaller as the distance from refinery increased, suggesting the usefulness of A.p. as an indicator of fluorine, In spite of the fluorine content, no visible symptoms of fluorine damage were observed in plants around the refinery.

57418
APTIC NO. 77477

Honma, Makoto and Yoshiteru Hirai

HEAVY METAL POLLUTION IN THE NEIGHBORHOOD OF ANNAKA REFINERY, TOHO ZINC CO., LTD., ANNAKA, GUNMA PREF. *(Gunma-ken Annaka-shi Toho Aen Annaka Seirenjo shuhen no fukinzoku osen ni tsuite). Text in Japanese. Preprint, Executive Committee for Symposium of Environmental Sciences, Tokyo (Japan), p. 144-145, 1975. (Presented at the Executive Committee for Symposium of Environmental Science, 1st Research Presentation Meeting, Tokyo, Japan, June 6-8, 1975.)*

Biologically important roots of mulberry trees are present at a depth between 10 and 20 cm., followed by a depth between 0 and 10 cm. The concentration of cadmium, zinc, lead, and copper were measured in the leaves of mulberry trees. The contents of these heavy elements were 1.12, 123, 11.9, and 6.9 ppm in the above order, in a distance between 0 and 1000 m from the Annaka refinery, which is the largest zinc refinery in eastern Asia. The concentrations were 0.68, 57, 7.4, and 6.0 in the above order to elements at a distance between 1000 and 2000 m. At further than 3000 m, the contents were 0.57, 40, 6.8, and 6.0 ppm. The investigation of the roots of mulberry trees revealed that fine roots are hardly found in a depth between 0 and 30 cm, where the pollution was the most severe, especially in the direction east northeast of the factory, at a point 600 m apart from the factory. In the eastern direction of the factory, the cadmium content in the leaves was much less than the trees in the east northeast direction. The development of the roots was also much better.

57419 **APTIC NO. 81049**

Jordan, Marilyn J. and Mary P. Lechevalier

EFFECTS OF ZINC SMELTER EMISSIONS ON FOREST SOIL MICROFLORA. *Can. J. Microbiol., 21(11):1855-1865, Nov. 1975. 23 refs.*

The effects of zinc smelter emissions on forest soil microflora were investigated. Within 2 km of a Zn smelter in Palmerton, Pa., up to 13.5% Zn by weight was measured in the oxygen horizon of the soil, and up to 8% Zn in the A subscript 1 horizon. Growth of most bacteria from control sites was reduced by 100 to 200 micron Zn, most actinomycetes by 100 micron Zn, and most fungi by 100 to 1000 micron Zn in thin Pablum extract agar. All the tested actinomycetes and non-spore forming bacteria isolated from Zn contaminated soils were Zn tolerant, growing normally in media containing 600-2000 micron Zn. Most fungi were capable of at least 50% of normal growth at 7000 micron Zn. Zinc-tolerant bacteria, actinomycetes, and fungi were readily isolated from low-Zn soils.

57420 **APTIC NO. 81469**

Kim, Tae Wook

INFLUENCE OF AIR POLLUTION ON THE GROWTH OF ORNAMENTAL TREE SPECIES-PARTICULARLY WITH REFERENCE TO SO2. *Text in Korean. Bull. Seoul Nat. Univ. Forestry, no. 11:49-76, Oct. 1975. 17 refs.*

The ability of Ginkgo biloba, Larix leptolepis, Pinus rigida, Syringa dilatata, Hibiscus syriacus, and Forsythia koreana to resist air pollution, particularly sulfur dioxide, was studied. The sensitivity was analyzed on the basis of the area ratio of smoke injury spots to the total leaf area. The color change and the site where the smoke spots frequently appeared were also observed. Hibiscus syriacus and Ginkgo biloba were the most resistant, Larix leptolepis and Pinus rigida the least, and Forsythia koreana and Syringa dilatata were intermediate. Recovery from SO2 fumigation was prominent in Hibiscus syriacus, Syringa dilatata, and Forsythia koreana due to their ability to sprout and to form adventitious buds. The smoke spot color differed by species: dirt blown in Syringa dilatata, brilliant yellow brown in Pinus rigida and Ginkgo biloba, whitish yellow in Hibiscus syriacus, and red brown in Forsythia koreana. The younger leaves of Ginkgo biloba and Larix leptolepis were more resistant to SO2. The sulfur content of leaves showed that on the basis of percentage dry weight, broad-leaved species contained more sulfur. Fifteen ornamental tree species in Seoul city were sampled. Regions of light and heavy pollution were determined. The SO2 absorbing capacities are discussed by species. (Author abstract)

57421 **APTIC NO. 74216**

Kitano, Hiroshi, Toshikiyo Shinohara, Yoshitada Yamamoto, Toshio Kimura, Akira Koiwai, Takuro Kisaki, and Michio Fukuda

STUDIES ON WEATHER FLECK OF TOBACCO PLANTS. PART 20. EXAMINATION ON PRACTICABILITY OF OXIDANT-INJURY-PROTECTING AGENTS FOR TOBACCO PLANTS. *(Tobacco no seiriteki hantenbyo ni kansuru kenkyu. Dai 20-po. Oxidant shogai bojo yakuzai no jitsuyoka no kento). Text in Japanese. Okayama Tabaco Shikenjo Hokoku (Bull. Okayama Tob. Exp. Stn.), no. 35:87-95, March 1975. 16 refs.*

Chemicals which showed effectiveness in protecting tobacco plants from ozone injury in laboratory screening, thiophanate methyl, benzimidazole, safroxane, and piperonyl butoxide, were tested in fields. Although the first three chemicals showed relatively high effectiveness, they were phytotoxic to tobacco plants under field conditions at higher concentrations. Piperonyl butoxide at a concentration of 0.1-0.5% in aqueous solution showed high (47-96%) protective action without any sign of phytotoxicity. Dry tobacco leaves treated with piperonyl butoxide tended to contain high amounts of sugar.

57422 **APTIC NO. 77402**

Martin, M. H. and P. J. Coughtrey

PRELIMINARY OBSERVATIONS OF THE LEVELS OF CADMIUM IN A CONTAMINATED ENVIRONMENT. *Chemosphere, 4(3):155-160, June 1975. 17 refs.*

The levels of cadmium in a woodland ecosystem situated closeto a primary lead-zinc smelter at Avonmouth, England are discussed. Plant, animal and soil samples were collected during the period Oct.-Dec. from a contaminated site .3 km downwind of the smelter and from a relatively unpolluted site 28 km northeast of the smelter. The highest levels of Cd are found in the topsoil and mosses and among the bark and leaves. Levels of Cd found in species of slugs show higher levels than in the species of plant on which they were found feeding. The levels of Cd in Arion hortensis, Agriolimax reticulatus, and Arion fasciatus are related to the feeding habits of these slugs. Analysis of two specimens of Accipiter nisus shows a marked accumulation of Cd in the kidney as compared to liver and lungs.

57423 **APTIC NO. 81257**

Masuda, T. and N. Isamoto

ON THE EFFECTS OF AIR POLLUTION ON TREES - DETERMINATION OF SULFUR CONTENT OF TREE LEAVES IN OITA CITY. *(Taikiosen no jumoku ni oyobosu eikyo ni tsuite - Oita-shi ni okeru jumoku ni iwo ganryo no kenshutsu). Text in Japanese. Oita-ken Ringyo Shikenjo Hokoku (Bull. Oita Pref. Forestry Exp. Stn.), no. 17:22-28, 1975.*

The sulfur content of tree leaves in 14 monitoring points in Oita City has been determined since 1968. The determination of the sulfur content of leaves of Cinnamonum camphora at 15 points in the city was conducted. The data of 14 points showed tendencies of both yearly increase and decrease; however, at the points where the effects of air pollution were most severe, the content of sulfur was relatively low and showed a decreasing tendency. These results indicate the necessity for accumulating yearly data.

57424 **APTIC NO. 81629**

Munekata, K. and T. Takasaki

ANALYSIS OF AERIAL ENVIRONMENTAL FACTORS WHICH AFFECT THE GROWTH AND THE HARVEST OF LOWLAND RICE IN CHIBA PREFECTURE FROM STATISTICAL DATA. PART 1. THE PRESUMED YIELD OF BROWN RICE FROM METEOROLOGICAL

FACTORS AND THE EXAMINATION OF PRESUMED DIFFERENCE. *(Tokei data kara mita Chiba-ken no suito seiiku shuryo ni oyobosu taikikankyo yoin no kaiseki. Part I. Kishoyoin karano genmai suiteiryo to sono suitei zansaryo no kento). Text in Japanese. Preprint, Crop Science Society of Japan, Tokyo, p. 130-131, 1975. (Presented at the Crop Science Society of Japan, Annual Meeting, Tokyo, Oct. 16-18, 1975.)*

To determine the factors (other than meteorological factors) affecting the recent reduction of rice yields in Chiba Prefecture, a statistical analysis was carried out on the relationship between the yield of brown rice and the meteorological factors such as temperature and hours of sunshine. The result showed a strong effect by locality between the areas along Tokyo Bay and the Pacific coast. The difference of brown rice yield between the two areas was 67 kg/10 acre to 57 kg/10 acre. It was determined that 85% of the difference was due to meteorological factors; the remaining 15% was probably due to other factors. This remaining percentage is increasing year after year.

57425 **APTIC NO. 77245**

Ota, Y.

FACTORS OF PLANT DAMAGE DUE TO PHOTOCHEMICAL SMOG. *(Kokagaku smog ni yoru shokubutsu higai no yoin). Text in Japanese. Kongetsu no Noyaku (Agric. Chem Mon.), 19(9):46-51, Sept. 1975*

Plant damage due to photochemical smog consisting mainly of ozone (90%) and peroxyacetyl nitrate (PAN) (0.6%) was divided into categories of ozone-type and PAN-type. Each type is described. Growth changes and inferior harvest resulted when the plants were exposed to small concentrations of pollutant. Ozone-type damage was further divided into minute spot sub-type (I) in which chlorophyll in the palisade parenchyma around the stomata was destroyed, bleached spot sub-type (II) in which the destruction of chlorophyll was greater, and necrosis sub-type (III) in which palisade parenchyma was destroyed. Sub-type (I) appeared when the ozone concentration was low; sub-type (III) appeared when susceptible plants were exposed to high concentrations of ozone. Peroxyacetyl nitrate damage was characterized by damage on the lower side of the leaves with destruction of the spongy parenchyma, silvery-white or brownish discoloration, and changes in the position of young leaves.

57426 **APTIC NO. 73847**

Sawada, Tadashi, Isamu Nouchi, Takeshi, Oohashi, and Toshio Oodaira

MORNING GLORY AS OXIDANT INDICATOR. *In: Annual Report of the Tokyo Metropolitan Research Institute for Environmental Protection. p. 1-8, 1975. 5 refs.*

Morning glory plants were exposed to ozone, peroxacetyl nitrate, and nitrogen dioxide to determine whether such plants can be used as oxidant indicators. Injury from ozone levels of 15 pphm was observed 4-8 hr after exposure and was chiefly in the form of bleached spots between internal veins or spots of necrosis. Leaves in the lower through middle positions along the stem were damaged. Peroxyacetyl nitrate exposures at 15 pphm for 24 hr resulted in grazing or bronzing bruised regions on the lower surfaces of leaves; only leaves in upper positions (fifth through eighth leaves, counting from the top leaf bud) were damaged. Nitrogen dioxide exposures at 2.5 ppm for 3 hr caused the appearance of large yellowish-brown necrotic regions between veins of mature leaves. Field surveys revealed spots of chlorosis, bleached spots, and spots of necrosis, in this order, as exposure levels increased. Injury was generally more severe in the lower leaves. Injury during field surveys was observed when the ambient oxidant concentration was either more than 15 pphm for over 2 hr or more than 80 pphm/hr in terms of daily dose. (Author summary modified)

57427 **APTIC NO. 74722**

Sukeda, Yasunobu and Takeo Yamamoto

EFFECTS OF ATMOSPHERIC FLUORIDE ON PLANTS. *(Shokubutsu ni oyobosu kichu fukkabutsu no eikyo). Text in Japanese. Nihon Nogeikagaku Kaishi (J. Agr. Chem. Soc., Japan), 49(7),341-346, July 1975. 14 refs.*

Gladiolus gandavensis, Citrus unshu, Colacasia antiguorum, Cryptomeria japonica, and Oryza sativa were utilized as plant indicators of air pollution by fluoride. There was a correlation between the fluoride content of the leaves of G.g. and C.u., with the correlation coefficient being 0.852 and 0.925, respectively. However, the rate of accumulation of fluoride in G.g. leaves was three times that of C.u. leaves. The content of fluoride in leaves and the visual injury of leaves differed from plant to plant; the fluoride content of C.j. was very high (2180 ppm) with total scorch, while that of C.a. was very low (66 ppm) with severe scorch. The ratio of calcium to silicon in G.g. was 4.38, and that in C.u. was 32.7. The relatively higher tolerance of C.u. to fluoride appeared to be due to the high calcium content and the high ratio of Ca to Si. There was a high correlation between the rice harvest and fluoride content of brown rice, the correlation coefficient being 0.91. When the fluoride content of brown rice exceeded 10 ppm, the harvest was reduced by 2/3 to 1/2 that of controls. Fluoride accumulation in polished rice did not increase by more than 12 ppm.

57428 **APTIC NO. 74145**

Suzuki, T.

THE ANNUAL RING WIDTH AND CONTENTS, ZINC AND LEAD IN THE RING OF CRYPTOMERIA JAPONICA GROWN IN CADMIUM POLLUTED AREAS OF ANNAKA CITY. *(Annaka-shi Cd osenchi no sugi no nenrin haba to nenrin-chu no Cd, Zn, Pb ganyuritsu). Text in Japanese. Nihon Ringaku Kaishi (J. Japan. For. Soc.), 57(2):45-52, Feb. 1975. 11 refs.*

The effect of stack gas from zinc refinery in Annaka on plants was investigated by examining the annual ring widths of Sugi trees (Cryptomeria japonica) grown near the refinery. The ring width became narrower with increasing concentrations of air pollution since 1955. The ring content of cadmium coincided with cadmium pollution due to dust fall. Cadmium pollution reached to a peak during 1954 - 1958 and decreased slowly afterwards. The annual ring width increased as the cadmium content of the wood decreased. Zinc and lead contents of the wood from contaminated trees were also higher than those measured in uncontaminated trees.

57429 **APTIC NO. 81391**

Taniyama, Tetsuo

STUDIES ON GROWTH DISTURBANCE OF CROPS BY HEAVY METALS. PART II. ON THE GROWTH OF FORAGE PLANTS IN THE POLLUTED LAND BY HEAVY METALS DUE TO A ZINC REFINERY. *(Sakumotsu no jyukizoku shogai ni kansuru kenkyu. Dai 2 ho. Aen seirenkojo (Gunmaken Annakashi) ni yoru jukinzokuto osennochi ni okeru bokuso no seiiku ni tsuite). Text in Japanese. Preprint, Crop Science Society of Japan, Tokyo, 5p., 1975. (Presented at the Crop Science Society of Japan, Annual Meeting, Tokyo, Oct. 16-18, 1975, Paper 1756.)*

The possibility that the arable land around a zinc refinery was sufficiently polluted by exhausted heavy metals and sulfur oxides to affect the productivity of the land was studied. Field tests using Italian rye grass and Ladino clover transplanted into the fields around a refinery, and small-scale pot tests using the soils of the field and non-polluted soils showed reduced growth for the plants planted in the soils around the refinery, from the viewpoint of stem number and dried weight of the leaves. Ladino clover was more severely growth-inhibited than Italian rye grass. The heavy metal contents of the polluted and non-polluted soils were cadmium 14 ppm/0.5 ppm, lead 210 ppm/12 ppm, zinc 1030 ppm/73 ppm and copper 150 ppm/29 ppm, respectively.

57430 **APTIC NO. 81493**

Taniyama, Tetsuo

STUDIES ON GROWTH DISTURBANCE OF CROPS BY HEAVY METALS PART III. GROWTH OF RICE PLANT AND HARVEST IN THE PADDY LAND POLLUTED BY HEAVY METAL AROUND A ZINC REFINERY, ANNAKA CITY, GUMMA PREFECTURE. *(Sakumotsu no jyukinzoku shogai ni kansuru kenkyu. Dia 3 po Aen seitetsu kojo, Gunmaken Annakashi ni yoru jyukizoku to osen nochi ni okeru ine no seiiku shuryo ni tsuite). Text in Japanese. Preprint, Crop Science Society of Japan, Tokyo, 7p., 1975. 1 ref. (Presented at the Crop Science Society of Japan Annual Meeting, Tokyo, Oct. 16-18, 1975, Paper 1757.)*

The growth inhibition of upland rice in a field near a zinc refinery, and of paddy rice potted in soils of the arable land around the refinery was studied. The growth of upland rice plants was extremely poor, especially by the dry weight. In the case of rice plants in flooded soil, not only the growth but also the ripening and the number of ears/stand were especially poor. In some plots in the field no harvest was obtained. Upland rice was more susceptible to pollution by heavy metals than lowland rice.

57431 **APTIC NO. 81553**

Terakado, K. and H. Hatta

RESULTS OF FIELD SURVEY OF AIR POLLUTION USING MORNING GLORY AND PROBLEMS WITH SURVEY. *(Asagao o tsukatta taikiosen genchichosa no kekka to mondaiten). Text in Japanese. In: Tokyo Metropolitan Agricultural Experiment Station 1974 Prompt Report, p. 52-53, 1975.*

Problems with the use of morning glory to measure air pollution are discussed from the results of a survey done in Tachikawa City. Damage to Scarlet O hara morning glory, planted in 103 places in the city (13 plants/place) was infrequent in July, but frequent and continuous since the end of the rainy season. The damage was recorded when the concentration (one-hour average) of oxidant was more than 8 pphm continuously for 3 hr with a cumulative value of 27-28 pphm. In order of severity, damaged leaves and white and brown spots on the leaves were observed, with sole local difference. The problems included: overgrowth, which makes observation difficult after continued days without oxidant; local differences of growth; simultaneous survey days; personal differences in observation of the damage; and the necessity for standardization of cultivation.

57432 **APTIC NO. 81253**

Toyama, S.

EFFECTS OF PHOTOCHEMICAL OXIDANTS ON THE FINE STRUCTURE OF CHLOROPLASTS. *(Yoryokutai no hisai kozo ni ataeru kokagaku okishidanto no eikyo). Text in Japanese. Saibo (Cell), 7(:1):519-530, 1975. 42 refs.*

The microscopic observation of chloroplasts in leaf cells of morning glory exposed to ozone-containing purified air (0.15 ppm) for 2, 4 and 8 hr is described. Contraction of chloroplasts, reduction of ribosomes and an increase of plast granules were common in leaves damaged by photochemical smog in the field. Chloroplasts exposed to peroxyacetyl nitrate showed no such changes. These findings suggest that the damage to chloroplasts by photochemical smog in fields was mainly due to ozone; however, as the degree of damage in the field was more severe than that in the laboratory experiment, a synergistic action of ozone and other oxidants or pollutants seems probable. Peroxyacetyl nitrate had no direct effect on chloroplasts; however, a secondery effect was possible.

57433 **APTIC NO. 74738**

Kanagawa Prefectural Center of Environmental Pollution (Japan)

COMPOSITION OF SOOT-DUST IN SMOKE TUNNEL AND THE INVESTIGATION OF ITS INFLUENCE. *(Endo baijin no seibun sosei to eikyo chosa). Text in Japanese. Kanagawa-ken taiki Osen Chosa Kenkyu Hokoku (Rep. Invest. Res. Air Pollut., Kanagawa Prefect.), no. 17:118-127, Feb. 1975.*

As a part of an investigation on the composition of soot dust and its effects on plants in smoke tunnel, a simple test of contacting the soot dust with the leaf surface was devised. Studies were performed to evaluate the harmful substances in the soot dust which caused visible damage to plant leaves. Leaf damage was observed near glass-melting furnaces, heavy oil boilers, and ovens for calcinating carbon electrodes; the damage was manifested as necrotic spots, greyish-white to greyish- brown in color, on leaves of tomato and chrysanthemum. The causal substances in the soot were acidic substances composed mainly of free sulfuric acid which is formed when sulfur-rich heavy oil is burned. The pH of the suspension of soot dust showed a close correlation with visible damage.

57434 **APTIC NO. 81260**

Fukuoka Environmental Research Center

RESULTS OF BOTANICAL SURVEY OF FOREST FOR ENVIRONMENTAL INDICATOR. *(Kankyo shihyo no mori shokubutsugakuteki chosa). Text in Japanese. Fukuoka-ken Eisei Kogai Senta Nenpo (Ann. Rep. Fukuoka Environ. Res. Center), vol. 1973:47-50, March 1975.*

Forests have been used as environmental indicators by the Prefectural Office in 10 places. The vegetation was surveyed once every 3 years. The survey consisted of a study of vegetation and the activities of trees. Results of the first survey are given.

57435 **APTIC NO. 81261**

Fukuoka Environmental Research Center

EFFECT OF AIR POLLUTION ON THE EPIPHYTIC BRYOPHYTAE AND LICHENS - DISTRIBUTION OF EPIPHYTIC BRYOPHYTAE AND LICHENS IN OMUTA CITY. *(Chakusei sentai chiirui ni oyobosu taikiosen no eikyo - Omuta-shi ni okeru chakusei sentai chiirui no bumpu). Text in Japanese Fujuoka-ken Eisei Kogai Senta Nenpo (Ann. Rep. Fukuoka Environ. Res. Center), vol. 1973:50-51, March 1975.*

The species and coverage rate of epiphytic plants such as bryophytes and lichens on cherry trees, Cinnamomum camphora and Ile x rotunda in Omuta City were surveyed. The distribution of such plants showed somewhat similar trends to the distribution of falling dust. A direct correlation between the amount of falling dust and the distribution of epiphytic plants could not be studied.

1974

57436 **APTIC NO. 81047**

Ballantyne, A. K.

THE MOVEMENT OF SALTS, AND EFFECTS OF CEREAL YIELDS RESULTING FROM THE APPLICATION OF POTASSIUM REFINERY DUST TO THE SOIL SURFACE. *Can. J. Soil Sci., vol. 54:45-51, Feb. 1974. 6 refs.*

Potassium mine refinery dust at rates from 1.12 to 11.2 ton/hectare was applied to a dark brown chernozemic silt loam and to a black chernozemic loam. No significant effects on yields of cereal grains have been recorded under dryland farming conditions. There is no indication that any K has moved deeper than 46 cm after 5 yr. The chlorides have been removed from the surface soil and about 50% have leached to below 213 cm. The K replaced some of the exchangeable calcium and magnesium which were subsequently leached to lower depths. Much of the added K is now in the exchangeable form; some may have become fixed in the clay lattice. (Author abstract)

57437 **APTIC NO. 81180**

Ishizaki, Atsumi and Masao Hasegawa

PHYSIOLOGICAL AND MORPHOLOGICAL PROPERTIES OF PINUM THUMBERGII AND P. DENSIFLORA IN THEIR RESISTIVITY TO AIR POLLUTION. *(Kuromatsu, Akamatsu no taikiosen teikosei ni kansuru seiri, keitaigakuteki seishitsu). Text in Japanese. Tamagawa Daigaku Nogakubu Kenkyu Hokoku (Bull. Fac. Agric., Tamagawa Univ.), no. 14:40-50, 1974. 15 refs.*

Experiments using 14-carbon dioxide were carried out on seedlings of 0-1 year old Pinus thumbergii and P. densiflora, to study their resistance to sulfur dioxide and to observe the morphological changes of chloroplasts. The seedlings were grown under either well fertilized or unfertilized conditions, and they were exposed to sulfur dioxide at 3 ppm for 3 hr and then exposed to 14-carbon dioxide of 200 microcurie under 20,000 lux for 3 hr. The difference of inhibition of photosynthesis was 10% in the fertilized condition, 16% in the unfertilized condition and 22% between the unfertilized exposed condition and the fertilized unexposed condition. Inhibition of the synthesis of malic acid and succinic acid due to sulfur dioxide exposure was noticeable. The inhibition of sugar synthesis was more in P.d. than in P.t. by 11.0% and that of amino acid synthesis was also more in P.d. than in P.t. by 16.7%, suggesting the relationship of these substances to the plant s resistance to sulfur dioxide. Disorders of the lamellar structure of leaves of exposed seedlings were seen in electron microscopic examination of both species.

57438 **APTIC NO. 81171**

Labeyrie, Jacques and Celestine Jehanno

ATMOSPHERIC FALLOUT AND SOIL FERTILITY IN GASCOGNE. *(Retombees atmospheriques et fertilite du sol en Gascogne). Text in French. J. Rech. Atmospheriques, 8(3-4):921-937, July-Dec. 1974. 16 refs.*

More than 98% of the mother-rock of the soil of the Landes de Gascogne is quartz sand. Most of the grains are almost spherical, with an average diameter of 125-200 micron. The concentration of potassium, sodium, magnesium and calcium salts is greater in the soil of old dunes and forests than on the beaches or in the old dunes. A comparison of drainage water samples from bodies of water draining only from forest plains to fall-out samples showed that the concentration of potassium and sodium was 2.2 times as great and the concentration of magnesium 5.4 times as great in the drainage water, while the concentration of calcium was one half as great. This is due, in part, to the filtration effect of the trees. It was concluded that the fertility of the soil of this region is due entirely to the fallout.

57439 **APTIC NO. 77391**

Nakano, M., T. Kimura, and K. Saito

SURVEY OF AIR POLLUTION DUE TO FLUORINE COMPOUNDS, PART 1. SILKWORM DAMAGE NEAR AN ELECTRIC STEEL WORKS. *(Fussonkagobutsu ni yoru taikiosen ni kansuru chosakenkyu, Sono 1, kinzokukojo shuhen ni okeru yosan higai ni tsuite). Text in Japanese. Shimane-ken Eisei Kogai Kenkyusho Nenpo (Annu. Rep. Shimane Prefect. Public Health Control Environ. Pollut. Inst.), no. 15, 1974.*

The death of silkworms attached to mulberry leaves and the unsuccessful production of cocoons near an electric steel works in Yasugi City, Shimane Prefecture were reported. The damage was due to some substance which adhered to the mulberry leaves in 1972. In 1973, dusts and gases in the works and around it were analyzed for fluorine content. Because of the addition of fluorite to electric furnaces in the reduction stage, the dust contained 1-3% fluorine near the furnace, while gases in the smokeway contained an average of 0.6 mg fluorine/cu m. The amount and fluorine content of dust fall in the mulberry orchard fluctuated between 3.28-9.36 mg/sq m/month (water soluble only) and 5.2-17.5 mg/sq m/month (water soluble).

57440 **APTIC NO. 81201**

Otani, A.

EXPOSURE EXPERIMENTS OF TREES TO SULFUR DIOXIDE GAS. PART 1. *(Jumoku no aryusangasu seshoku shiken. Dai 1 po). Text in Japanese. Aichiken Ringyo Shikenjo Gyomu Hokoku (Bull. Aichi Prefect. Forest Exp. Stn.), vol. 1974:73-89, Dec. 1974. 6 refs.*

The effects of gaseous sulfur dioxide on trees were studied. Twenty species of plant seedlings (70 cm in height) including Cedrus deodara, Metasequoia glyptostroboides, Ginkgo biloba, Celmus parvifolia var. albo-marginata, Pinus thumbergii, P. densiflora, Cryptomeria japonica, and Quercus myrsinaefolia, were exposed in a room to gaseous sulfur dioxide at 0.8 ppm for 7.5 hr/day (from 9 am to 4:30 pm) for 24 days at a temperature of 20 - 35 deg C and RH of 55-75%. Visible damage plants was lighter in C.j and Chamae cyparis obtusa, more severe in P.t., G.b., and C.d. The damage appeared earlier in G.b., Cinnamomum camphona, and Ilex rotunda, and the change of early symptoms was smaller in P.t., C.j., and C.o. The leaves of the 4-5th positions from the sprout were apt to be damaged. Although the sulfur content of exposed leaves increased markedly, that in other parts did not increase. Because of the high concentration of the gas and the short period of exposure, the absorption of sulfur into leaves should have differed from the situation in fields where longer exposure to lower concentrations of the gas would be expected.

57441 **APTIC NO. 81114**

Rolfe, Gary L.

LEAD DISTRIBUTION IN TREE RINGS. *Forest Sci., 20(3):283-286, Sept. 1974. 11 refs.*

The potential of tree rings as indicators of environmental lead accumulation is evaluated. Three sampling locations were selected to provide several tree species, including sugar maple, red oak, and loblolly pine, and a range of potential lead inputs based on traffic volume. Increment cores were taken from six trees of each species at locations near and remote to automobile traffic and subsampled for prior and current 10-year growth segments. The segments were analyzed by atomic absorption spectrophotometry to obtain average lead concentrations. In cores taken near roads, significantly higher lead concentrations were found in the last 10-year growth period than in the earlier 10-year growth period. Lead concentrations in cores from trees remote to roads showed no significant increase over time. (Author abstract modified)

57442 **APTIC NO. 78360**

Tachiya, T., H. Tatekawa, and T. Kanno

STUDIES ON THE HEAVY METAL POLLUTION OF CROPS AND SOIL IN FUKUSHIMA PREFECTURE, PART III: INFLUENCE OF CADMIUM POLLUTION OF RICES AND SOIL WITH WIND DIRECTION IN EAST PART OF BANDAI TOWN IN 1970-1971. *(Fukushima-ken ni okeru nosakumotsu oyobi dojo no jukinzoku osen no jittai- dai 3po- 1970-1971 nen ni okeru Bandai-cho tobu no fuko to Cd osen tono kankei). Text in Japanese. Fukushima-ken Nogyo Shikenjo Kenkyu Hokoku (Annu. Rep. Stud. Fukushima Prefect. Agr. Exp. Stat.), no. 13:1-7, March 1974. 2 refs.*

Cadmium contents of soil and rice in the eastern part of Bandai Town were studied in connection with wind direction, the area having been officially designated as a Cd-polluted district. Wind direction of the area during rice-growing season tended to be ESE-SE (32%). There are four wind courses in the area: A, B, C and D, A and B being the most frequent. The Cd con tent of the soil was inversely proportional to the distance from the origin of pollutant (a refinery), in every wind direction except for course D. Cd content of brown rice and rice straw was also inversely proportional to the distance from the origin of pollutant, except for course D, and it was noticeably high in areas where the wind was weak and there were wind drifts. There was a correlation between Cd in the soil and Cd in brown rice in every wind course. However, no such correlation was found in places where there were wind drifts. The intake of Cd by rice plants was higher in places where the absorption by leaves was greater.

57443 **APTIC NO. 81288**

Van Hook, C.

FLUORIDE DISTRIBUTION IN THE SILVERBOW, MONTANA, AREA. *Fluoride, 7(4):181-199, Oct. 1974. 45 refs.*

The distribution of fluoride in soil and plants from a 16,000-acre area contaminated by a phosphorus extraction facility emitting fluoroapatite dust and hydrogen fluoride was investigated. Mean fluoride concentrations in vegetation ranged from 20 ppm to over 100 ppm. Fluoride concentrations as high as 420 ppm, about 40 times greater than control values, were measured in Rocky Mountain junipers, the most commonly sampled tree in the study area. The pattern of fluoride distribution in juniper was similar to that in forage grasses growing in the area. Although localized high concentrations of fluoride were measured in soil samples near the plant, fluoride pollution of the soil appeared to be less widespread than that of vegetation.

57444 **APTIC NO. 81286**

Walker, Jerry T. and James C. Barlow

RESPONSE OF INDICATOR PLANTS TO OZONE LEVELS IN GEORGIA. *Phytopathology, 64(8):1122-1127, Aug. 1974. 16 refs.*

A number of ozone indicator plant species were exposed to ambient levels of ozone at various urban and rural locations throughout Georgia. Bel-W3 tobacco and Snowstorm petunia plants which were exposed to ambient air beneath an antiozonant-treated cloth were generally taller and weighed more than companion plants under nontreated cloth chambers. Ratings of foliar injury on Bel-W3 plants were less, though not always significantly so, for plants in treated chambers than for those in nontreated chambers. Oxidant levels monitored in Atlanta during the exposure study averaged 2.6 pphm hourly, and 16 episodes of oxidant concentrations greater than 5 pphm for 5 hr occurred during this period. Injury that was typical of fluoride poisoning occurred regularly on Snow Princess gladiolus at one location, irrespective of chamber conditions or the exposure period. Ozone appeared to be present in sufficient concentrations at both urban and rural locations to cause injury and retard growth of indicator plants. (Author abstract modified)

57445 **APTIC NO. 78715**

Zelawski, W. and A. Lotocki

PHOTOSYNTHETIC CAPACITY OF SCOTS PINE (PINUS SILVESTRIS L.) NEEDLES FROM A FOREST SUBJECTED TO CHRONIC INDUSTRIAL POLLUTION. *Bull. Acad. Polon. Sci. Ser. Sci. Biol., 22(6): 431-434, Aug. 1974. 13 refs.*

The photosynthetic capacity of pine needles from polluted and unpolluted stands was investigated using the manometric technique under laboratory conditions. Current year and previous year needles were examined throughout the whole yr. High photosynthetic capacity was maintained in needles of pines subjected to chronic industrial pollution until the period of abscission which, under these conditions of growth, is considerably hastened. The reduction of productivity of such stands should be explained by diminished number and size of assimilatory organs rather than by direct effects of industrial pollution on photosynthetic capacity. (Author abstract)

57446 **APTIC NO. 81411**

URBAN PLANTS VS. POLLUTION. BREEDING RED MAPLES FOR URBAN ENVIRONMENTS. GAINING KNOWLEDGE OF SO2 EFFECTS. *Agri. Res., 23(2):3-6, Aug. 1974.*

The discovery of wide variation in genetic traits of red maple trees is stirring hopes for breeding improved trees that are able to withstand inhospitable urban environments. Studies are also underway to help enable urban trees to survive while filtering considerable volumes of pollutants from the air. Significant differences have been found in the ability of leaves of woody plants to take up sulfur dioxide from their microenvironment. Eventually it may be possible to recommend which trees, shrubs, or combinations of plants would be most suitable as pollution fighters. Changing weather conditions could have tremendous effects on pollutant uptake and effects on the plant. The fate of SO2 in woody plants has been studied with radioactive tracers. Sulfates can be used as nutrients by the plants. Popular cuttings and maple seedlings of different genetic origins differed significantly in their susceptibility to SO2 damage. The SO2 damages chloroplasts, affecting photosynthesis. Studies on red maple seedlings indicate a reduction in photosynthesis as a result of SO2 pollution. Results of experiments indicate that, unless plants are injured by the pollutant, SO2 uptake remains constant over a 6 hr period. Stomata in the leaves of trees which are tolerant to shade may open and close faster, making these trees more tolerant to pollution. Seedlings most capable of removing pollutants from the air have also been severely damaged.

1973

57447 **APTIC NO. 74610**

Cremer, H. D.

PATHOGENIC FACTORS IN FOODS OF ANIMAL AND VEGETABLE ORIGIN. *(Pathogene Faktoren in Lebensmitteln pflanzlicher und tierischer Herkunft). Text in German. Verh. Deut. Ges. Inn. Med., vol. 79:46-54, 1973.*

Possible pathogenic effects of food additives and contaminants, such as pesticide residues, nitrites, aflatoxins, and heavy metals are discussed. Lead, emitted by lead smelteries and motor vehicles, may constitute a health hazard for humans and animals. Some 60 cattle died and many more had to be slaughtered due to ingestion of grass contaminated with lead as a result of a filter defect in a lead smeltery in Nordenham, West Germany. Vegetables grown nearby the smeltery contained high amounts of lead on their surface.

57448 **APTIC NO. 81309**

Hall, R., G. Hofstra, and G. P. Lumis

LEAF NECROSIS OF ROADSIDE SUGAR MAPLE IN ONTARIO IN RELATION TO ELEMENTAL COMPOSITION OF SOIL AND LEAVES. *Phytopathology, 63(11):1426-1427, Nov. 1973. 9 refs.*

Leaf necrosis of sugar maple trees located 1-7.6 m from the pavement of a highway in Guelph, Ontario was examined in relation to elemental concentrations measured in leaves and soil. Levels of sodium and chloride in foliage and levels of sodium and total soluble salts (conductivity) in the soil were significantly greater at the sides of trees facing the highway than they were at the opposite sides. No significant differences between the front and back tree sides were observed for foliar concentrations of nitrogen, phosphorus, or potassium. De-icing salt appeared to contribute to the leaf necrosis of trees along the highway. Foliar levels of chloride or sodium greater than 0.5% were usually associated with moderate to severe injury.

57449 **APTIC NO. 78595**

Harper, G. J.

THE INFLUENCE OF URBAN AND RURAL AIR ON THE SURVIVAL OF MICROORGANISMS EXPOSED ON MICROTHREADS. *Aerobiol. Airborne Transm. Airborne Infect., Proc. 6th Intern. Symp. Enschede, Netherlands, 1973 (?), p. 151-154. 4 refs.*

The microthread technique of exposing microorganisms to both urban and rural air samples was employed in an effort to define the constituents responsible for a germicidal open air factor. Tests conducted in an urban area revealed a strong association between mean viability and the passage of air over the urban complex. The mean microorganism viability in and downwind of the city was usually lower than that at upwind sites. A marked reduction in mean viability downwind of a large oil refinery suggested that olefins might be the principal contributor to the open air factor. There was no strong association between mean viability and sulfur dioxide concentrations. Tests in and around forested areas were negative, with mean viabilities being similar for upwind, downwind, and in-forest sites. Laboratory tests simulating terpene generation by coniferous trees in the presence of ozone did reveal toxic effects to microorganisms such as Escherichia coli and T7 coliphage, indicating that under certain conditions materials released from forests may contribute to the germicidal open air factor.

57450 **APTIC NO. 78686**

Miyake, Y. and Y. Uno

STUDIES ON PHYSIOLOGICAL TOBACCO LEAF SPOT (PART VII) EFFECTS OF SULFUR DIOXIDE ON THE GROWTH AND CHEMICAL COMPONENTS OF TOBACCO PLANT. *(Tabako no seiriteki hanten shogai ni kansuru kenkyu (dai 7 ho) aryusan gasu no chokikan bakuro ni yoru tabako no seiiku to naiyo seibun ni oyobosu eikyo). Text in Japanese. Utsunomiya Tabako Shikenjo Hokoku (Bull. Utsunomiya Tob. Exp. Stn.), no. 12:67-76, Oct. 1973. 21 refs.*

In order to investigate the effects of sulfur dioxide on the growth and contents of inorganic components and carbohydrates in tobacco plants, flue-cured tobacco cultivar MC1610 (1), and cigar tobacco variety Bel W3 (2) were exposed continuously to air containing at concentrations 14 and 30 pphm for 50 (1) and 57 days (2) in a polyvinyl chloride greenhouse. From about the 10th day after termination of exposure, chlorotic symptoms were observed on the leaves of both plants exposed to 30 pphm. A reddish-brown color appeared on the peripheral part of the upper leaves, as well as the white spots which occur frequently on ozone-exposed tobacco leaves. There was weight of dried arterial parts, and decreases in stem, maximal leaf length and leaf width in cultivar MC1610 exposed to 30 pphm. These reductions were not clear in variety Bel W3. The sulfur content in leaves, stems, and roots of the plants exposed to 30 pphm of SO_2 were higher than those of control plants, especially in leaves, the content being four to six times that of the control. The contents of potassium and rough ash were higher in the plants exposed to 30 pphm than in those exposed to 14 pphm; starch, dextrin and intra-leaf pH decreased as the SO_2 concentration increased. Total nitrogen, phosphoric acid, manganese, iron and zinc contents varied with SO_2 concentration and type of plant.

1971

57451 **APTIC NO. 81046**

Ballantyne, A. K.

WHEAT YIELDS AND CHANGE IN CATIONS AFTER LEACHING SOIL WITH WATER CONTAINING INCREASING RATES OF POTASSIUM REFINERY DUST. *Can. J. Soil Sci., vol. 51:405-410, Oct. 1971. 5 refs.*

A silt loam soil in clay pots was leached with water and with water containing 1.12, 2.24, 5.60, 11.2, 22.4, and 44.8 metric ton/hectare of potassium chloride dust. A control was not treated until seeding. Germination was greatly reduced by the treatment with 22.4 metric ton/hectare and nearly eliminated by 44.8 ton. The 44.8 ton/hectare treatment also greatly reduced the yield of grain, but straw weights were affected very little by increasing rates of potassium salt dust. The response to fertilizer was also reduced by 22.4 and 44.8 ton. The exchangeable calcium and magnesium decreased and potassium increased as increasing amounts of potassium dust were leached through the soil. The 44.8 ton treatment decreased the exchangeable Ca from 56.0 to 24.9% and the Mg from 21.2 to 4.9%, and increased the K from 7.2 to 51.9%. Potassium salts can be added to the soil, without any adverse effects, until the exchangeable K is increased to about 30%. The amount of K salt required to bring the exchangeable K to this level will vary with different soils. This took more than 11.2 ton/hectare with the soil under study. The application of dolomite ameliorated the effect of excess K. (Author abstract modified)

EFFECTS-MATERIALS

1976

57452 **APTIC NO. 81390**

Haylock, J. C. and J. L. Rush

STUDIES ON THE OZONE FADING OF ANTHRAQUINONE DYES ON NYLON FIBERS. *Textile Res. J., 46(1):1-8, Jan. 1976. 10 refs.*

The effects of humidity, temperature, and ozone concentration on the ozone fading of blue anthraquinone days on nylon yarns was investigated before and after steam heat setting. Disperse and basic dyes were sensitive to the presence of atmospheric O_3 at high humidity, whereas acid dyes are less sensitive. The rate of fading varies for different dyes within each of these three classes. The rate of O_3 fading is determined primarily by the rates of diffusion of the dye molecules in the fiber. Under such conditions fibers are damp and may even contain capillary condensed water in which O_3 or other chemically active species could be dissolved. If dye is desorbed from the fiber into a surface water layer of this type, it could rapidly be destroyed or decolorized. Chemical reactions involved in fading proceed may favorably near the fiber surfaces than in the fiber interior. (Author abstract modified)

EFFECTS-ECONOMIC

1976

57453 **APTIC NO. 81397**

Naruse, Rikio

CORRELATION BETWEEN AMOUNT INVESTED IN ENVIRONMENTAL POLLUTION CONTROL AND OPERATION COST. *(Kogai boshi toshigaku to untenhi tono sokan). Text in Japanese. Puranto Enginia (Plant Eng.), 8(1):49-53, Jan. 1976. 8 refs.*

Total industrial investment for pollution control exceeds 4 billion dollars for fiscal year 1974 alone. On the other hand, the running cost for pollution prevention is estimated to be 5-6.2% of the total sales in the iron and steel industries, 8.2% in the electric power industries and 4.8% in the paper pulp industries in 1977. The correlation between environmental pollution control investment and the operating costs for air pollution control, water pollution control, and industrial waste management were studied. An accurate estimate of the pollution prevention cost is difficult. The guidlines for cost concepts for pollution prevention are introduced. Dust collecting equipment and exhaust gas desulfurization equipment for air pollution prevention are discussed in terms of: technical stability, stability of maintenance and operation, determining factors for running cost, and considerations for future equipment control. Dehydration-incineration costs equipment control, and utilization of waste heat for industrial waste disposal equipment are also discussed.

1975

57454 **APTIC NO. 81721**

Mitsuwa, Yoshiro and Mamoru Shimazaki

PROPER STATUS OF THE ENVIRONMENTAL POLLUTION REGULATIONS AND INDUSTRIAL ACTIVITIES: CASE STUDY ON AUTOMOBILE EMISSION REGULATIONS. *(Kogai kisei no arikata to sangyo katsudo: jidosa haigasu kisei no keisu sutadi). Text in Japanese. Sangyo To Kankyo (Ind. Environ.), vol. 1975:77-81, Nov. 1975.*

Effects of pollution regulations on industrial activities are discussed, with the automobile industry as a case study. Automobiles were selected for study, because automobile ownership is over 22 million, and pollution is not localized, because of the mobile nature of the automobile. Local citizen action is difficult because of the diffuse nature of the pollution. Since car owners and users are also polluters, they tend to play down the effects of pollution. At present, low pollution cars cost about $170-$230 more than their high pollution counterparts (cost $2300-$3000). Only about 5% of the total automobile production for domestic consumption in Japan (234,731 cars) in July 1975 was due to low pollution cars. When increase in passenger car production for July 1975 over that for July 1974 was broken down in terms of automakers, gains were reported by Toyota (20.5%); Nissan (25.9%); Mitsubishi (25.4%); Toyo (2.3%); Honda (-1.2%). Cost and performance favor the high pollution cars. Levying high taxes on high pollution cars, and providing means of facilitating purchase of low pollution cars could be a solution.

57455 **APTIC NO. 81066**

Stephens, W. C. and R. I. Simon

AN ECONOMIC AND FINANCING MODEL FOR IMPLEMENTING SOLID WASTE MANAGEMENT/RESOURCE RECOVERY PROJECTS. *Wheelabrator-Frye,Inc., Basking Ridge, N. J., Energy Systems Div., Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 422-427. (Nov. 3-5.)*

An economic and financing model was developed for implementing solid waste management/resource recovery projects. The model is designed to serve as a first step in the analysis of a proposed project. It can be adapted to computerized form, which is useful in testing the sensitivity of the economic data to changes of input variables. The model assumes that certain technical and economic data are known and can be used as input. These data can be expressed in terms of a range of possible inputs in order to test the sensitivity of the return on investment to different inputs, or to determine necessary changes in one input as a result of changes in another. The model is applied to a refuse to energy plant in Saugus, Mass.

57456 **APTIC NO. 81113**

Wuhrmann, K. A.

HOW ECONOMIC IS ENERGY RECOVERY FROM WASTE? *Swiss Federal Inst. of Technology, Zurich (Switzerland), Convers. Refuse Energy Int. Conf. Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 404-406. 11 refs. (Nov. 3-5.)*

The reuse of solid waste organic material as a low-grade raw material or a fuel is discussed. A plan for district heating is described. The cost of developing an incinerator plant in eastern Switzerland with an annual capacity of 20-40,000 ton was determined. A full fledged incinerator was installed which is capable of taking bulky, often highly energetic wastes and burning them in accordance with federal regulations - 100 mg of grit and dust/normal cu m, no effluent with a pH below 6.5, and no heat load for the adjacent canal resulting in more than a 30 C rise of temperature. A unit designed according to these criteria cost more than $3,000,000. Supplementary costs for heat recovery were $600,000.

57457 **APTIC NO. 76859**

ENVIRONMENTAL POLLUTION CONTROL INVESTMENTS EXCEEDING 1 TRILLION YEN ($3.3 BILLION). *(Ichi-cho yen o koeta kogai boshi toshi). Text in Japanese. Toyo Keizai Tokei Geppo (Stat. Mon. Pap. Toyo Keizai), 35(6):28-31, June 1975.*

Pollution control expenditures by Japanese industries for 1972-1975 are listed. Projected annual expenditures will probably exceed 1 trillion yen ($3.3 billion) shortly. According to 1973 figures, cost of equipment for control of air and water pollution comprised 86% of the total expenditures. About $700 million each were spent for air and water pollution control equipment and installations. Projected growth rates for pollution control expenditures for 1975 range from 31-40% over 1974 figures. According to surveys by MITI on 1975 plans, the highest industrial pollution control expenditures (in million of dollars) are as follows: (percentages indicate portion of the total expenditures spent on pollution control by the industry) petroleum, $891, 40.5%; steel, $837, thermal power, $791, 46.4%; chemical (excluding petrochemical), $789, 34.0%; petrochemical, $294; mining (excluding coal), 36.2%; and paper, pulp, 30.9%; More than 60% of the pollution control expenditures have been budgeted for air pollution control by thermal power, petroleum, and non-ferrous metal industries. Paper and pulp industries have budgeted more than 60% of their pollution control expenditures for water quality deterioration control. Expenditures on secondary pollution control installations have been increasing noticeably.

1974

57458 **APTIC NO. 75245**

Bucy, J. I. and P. A. Corrigan

TVA-EPA STUDY OF THE MARKETABILITY OF ABATEMENT SULFUR PRODUCTS. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 969-1001, Dec. 1974. (Nov. 4-7.)*

Studies on the marketability of abatement sulfur products generated by seven Tennessee Valley Authority coal-burning steam plants were performed with the aid of a production-distribution model. The net sales revenue above distribution costs for the approximately 2 million tons of sulfuric acid that can be produced annually by TVA is $8.75/ton. The use of 10% of this acid for the production of wet-process phosphoric acid or other fertilizer results in a net sales revenue increase of about 50 cents/ton of sulfuric acid. Studies of the potential marketability of gypsum by-product from lime scrubbing processes indicate that the advantage over a throwaway process can range from nothing to over $16/ton of gypsum, depending on the power plant location and processing costs. This advantage for a 500 MW power unit can be as much as $3.8 million/yr in terms of reducing the cost of operating a lime-scrubbing, solids-throwaway system, i.e., a 45% cost reduction.

1973

57459 **APTIC NO. 81550**

Odum, Howard T.

ENERGY, ECOLOGY, AND ECONOMICS. *Ambio, 2(6):220-227, 1973.*

The energy control of the economy and the relationship to the environment are discussed. The true value of energy to society is the net energy, which is found after the energy costs of getting and concentrating that energy are subtracted. Worldwide inflation is driven in part by the increasing fraction of fossil fuels that have to be used in getting more fossil and other fuels. Many calculations of energy reserves which are supposed to offer years of supply are expressed as gross energy rather than net energy and thus may be of much shorter duration than often stated. Societies compete for economic survival by Lotka s principle, which says that systems win and dominate that maximize their useful total power from all sources and flexibly distribute this power toward needs affecting survival. Energy sources which are now marginal, being supported by hidden subsidies based on fossil fuel, become less economic when the hidden subsidy is removed. Increasing energy efficiency with new technology is not an energy solution, since most technological innovations are really diversions of cheap energy into hidden subsidies in the form of fancy, energy-expensive structures. An economy must maximize its use of energy from sun, wind, waters, and waves. Environmental technology which duplicates the work available from the ecological sector is an economic handicap. Use of solar energy has already been maximized by forests and food producing plants. The ability do work depends on the energy quality as well as quantity. Many kinds of growth-priming activities may favor economic vitality during periods of expanding energy availabilities. The many high density and growth promoting policies and structures become an energy liability during periods when expansion of energy sources is not possible, because their high energy cost is no longer accelerating energy yield.

STANDARDS AND CRITERIA

1975

57460 **APTIC NO. 81131**

Hoffman, Alan J., Thomas C. Curran, Thomas B. McMullen, William M. Cox, and William F. Hunt, Jr.

EPA S ROLE IN AMBIENT AIR QUALITY MONITORING. *Science, 190(4211):243-248, Oct. 17, 1975. 16 refs.*

Methods used for ascertaining conformity in ambient air quality monitoring to establish standards are described. The Environmental Protection Agency established National Ambient Air Quality Standards (NAAAS) for five pollutants. Progress toward attainment of these standards is monitored by the states under EPA approved State Implementation Plans. Data from state monitoring networks, which were approximately 80% complete in 1974, are routinely submitted to the EPA. Various statistical summaries and analyses are performed and reported by the EPA on a national scale, and the data are used for establishing control policies, priorities, and strategies. To ensure valid, comparable data from the state monitoring networks, the EPA has specified reference methods of NAAQS pollutants. Other candidate methods are currently being evaluated fro equivalency to the reference methods. For the same purpose, EPA established guidelines for quality assurance as related to air pollution monitoring. The guidelines cover such aspects as station location, instrument operation, and data handling, validation, and reporting. (Author conclusions modified)

57461 **APTIC NO. 75341**

Environmental Protection Agency, New York, Regional Office II, TRW, Inc., Vienna, Va., Environmental Services, and Office of Air and Waste Management Research Triangle Park, N. C., Office of Air Quality and Planning and Standards

IMPLEMENTATION PLAN REVIEW FOR NEW YORK AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT (FINAL REPORT). *Office of Air and Waste Management Contract 68-02-1385, Rept. EPA- 450/3-75-044, 55p., April 1975.*

NTIS: PB 241934/AS

A review of New York State s implementation plan to determine if total suspended particulate and sulfur dioxide regulations for stationary fuel combustion sources are overly restrictive is presented in compliance with the Energy Supply and Environmental Coordination Act of 1974. There are no Air Quality Control Regions which show good or marginal potential for revision of fuel combustion source emission regulations for total suspended particulates. Good potential for revision of SO2 emission regulations exists in two ACQRS: Central New York and Southern Tier East. The Genessee-Finger Lakes and Southern Tier West ACQRs show marginal potential for SO2 emission regulation revision; however, emissions from fuel combustion sources contribute a large percentage of the total emissions in these regions, and an increase in emissions may have an adverse impact on air quality. Air quality data and emission factors for significant contributors are presented in appendices.

57462 **APTIC NO. 75363**

Environmental Protection Agency, Dallas, Tex., Regional Office VI, TRW, Inc., Redondo Beach, Calif., Environmental Services and Office of Air and Waste Management, Research Triangle Park, N. C., Office of Air Quality and Planning and Standards

IMPLEMENTATION PLAN REVIEW FOR TEXAS AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT. *Office of Air and Waste Management Contract 68-02-1385, Rept. EPA-450/3-75-025, 82p., April 1975. 13 refs.*

NTIS: PB 241931/AS

A review of the Texas implementation plan to determine if total suspended particulate and sulfur dioxide regulations for stationary fuel combustion sources are overly restrictive is presented in compliance with the Energy Supply and Environmental Coordination Act of 1974. Air quality data indicate a widespread particulate problem throughout the state, suggesting that any increase in total suspended particulate emissions is unwarranted. There is no indication that sulfur dioxide National Ambient Air Quality Standards are being violated; however, because the restrictiveness of the state s SO2 regulations cannot be evaluated, it is not known if the low SO2 levels are the result of an overly restrictive control of emissions, a low fuel sulfur content, or some other factor such as meteorology. Air quality data and emission factors for significant contributors are presented in appendices.

1974

57463 **APTIC NO. 73073**

Farmer, Jack R.

ENVIRONMENTAL QUALITY AND STANDARDS FOR AIR. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 7-10, Oct. 1974.*

The key provisions of the Clean Air Act of 1970 are discussed as they affect fuel conversion processes. Primary emphasis is placed on Section 111, standards of performance for new stationary sources, and the role these standards play in the national strategy for air quality management. New source performance standards were issued for 12 source categories: fossil-fuel-fired steam generators, portland cement plants, incinerators, nitric acid plants, sulfuric acidd plants, asphalt concrete plants, petroleum refineries, storage vessels for petroleum liquids, secondary lead smelters, secondary brass and bronze ingot production plants, iron and steel plants, and sewage sludge incinerators. The Section authorizes the issue of standards of performance for sources of pollutants which have not been covered by a national ambient standard or a hazardous air pollutant standard such as sulfuric acid mist. These pollutants are referred to as designated pollutants. An accelerated program for new source performance standards is being planned which will result in more standards in a shorter time period. Emphasis will be placed on the following areas: nitrogen oxides, hydrocarbons (oxidants), sources reviewed in accordance with significant deterioration regulations, emerging industrial processes, augmentation of the air quality management approach, and designated pollutants. The current standards, the standards development process, and plans for future standards are discussed. (Author abstract modified)

LEGAL AND ADMINISTRATIVE

1976

57464 **APTIC NO. 81604**

Quarles, John

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES: CERTIFICATION AND TEST PROCEDURES. REVISED LIGHT DUTY TRUCK REGULATIONS FOR 1978 AND LATER MODEL YEAR VEHICLES. *Federal Register, 41(30):6279-6281, Feb. 12, 1976.*

The Environmental Protection Agency is considering amendments to the Code of Federal Regulations to expand the light duty truck class definition and impose more stringent exhaust emission standards on trucks in the new light duty truck class. The provisions would apply to 1978 and later model year new vehicles. Exhaust emission standards for hydrocarbons, carbon monoxide, and oxides of nitrogen are included. No crankcase emissions could be discharged from a gasoline-fueled light-duty truck. A new section on application for certification would be added to the regulations. A maximum vehicle curb weight would be specified by the manufacturer for incomplete light-duty trucks. Light duty trucks will carry a simulated payload of 200 lb of ballast for mileage accumulation. Light duty vehicles over 5750 lb loaded vehicle weight would be tested with a 5500 lb equivalent inertia and a 14.4 horsepower road load. The records required would be specified.

1975

57465 **APTIC NO. 76697**

Brail, Richard K.

LAND USE PLANNING STRATEGIES FOR AIR QUALITY MAINTENANCE. *Air Pollution Control Assoc., Pittsburgh, Pa., Spec. Conf. Long Term Maint. Clean Air Stand., Chicago, Ill., 1975, 15p. 18 refs. (Feb.)*

An analysis of how land use planning, through emission quota strategies, can be utilized in the long-term maintenance of air quality in metropolitan areas is presented. The following four emission quota strategies are discussed: emission allocation planning (jurisdictional emission quotas), district emission quotas, floating zone emission quotas, and emission density zoning (unit area emission quotas). The accuracy of planning and emission projections for air quality maintenance requires the development of a monitoring and feedback system which integrates planning and air pollution control.

57466 **APTIC NO. 81220**

Buck, Manfred

AIR QUALITY MONITORING IN NORTH RHINE WESTPHALIA. *(Luftqualitaetsueberwachung in Nordrhein-Westfalen). Text in German. In: Grundlagen Luftreinhaltung Laermbekaempfung Nordrhein-Westfalen, vol. 2:52-61, 1975. 16 refs.*

The principles, status and prospects of air quality monitoring in Northrhine-Westphalia are described. Air quality monitoring serves the acquisition of information on background concentrations as a basis of licensing procedures for planned emission sources, air pollutant concentration monitoring for smog alarm, and for compliance control and for the substantiation of additional emission control measures. At present, there are three hierarchic monitoring networks, including a mobile network for random sampling of sulfur dioxide, dustfall, fluorine compounds, nitrogen dioxide, total organic carbon, and suspended matter at about 4000 sampling sites. This network furnishes data for licensing decisions. Another partly automated network of 71 stations is used to measure suspended matter and heavy metals, e.g., arsenic, and other carcinogenic metals. The mobile stations will be increasingly used for the monitoring of organic substances, e.g., benzene and its homologs, formaldehyde and related compounds. A fully automated real-time telemetric network, comprising presently 15 SO2-monitoring stations, is used partly for the measurement of carbon monoxide, NO2, and nitric oxide. This network furnishes data for smog alarms.

57467 **APTIC NO. 81124**

Chang, T. Y. and B. Weinstock

GENERALIZED ROLLBACK MODELING FOR URBAN AIR POLLUTION CONTROL. *J. Air Pollution Control Assoc., 25(10):1033-1037, Oct. 1975. 14 refs. (Presented at the Symposium on Atmospheric Diffusion and Air Pollution, Santa Barbara, Calif., Sept. 1974.)*

A general formula to calculate the reductions in emissions of inert pollutants required to achieve National Ambient Air Quality Standards (NAAQS) and to predict future urban atmospheric concentrations was derived. The derivation incorporates the main features of atmospheric diffusion modelling and takes account of all categories of sources and their spatial distribution. The new general formula is applied to Phoenix-Tucson using Environmental Protection Agency data. Phoenix-Tucson will meet the NAAQS for carbon monoxide by 1985 if a 12 g/ml light duty vehicle emission standard is adopted. The EPA, using the same data in a modified rollback analysis, had predicted that Phoenix-Tucson, as well as a number of other localities, would not achieve the NAAQS even if the 3.4 g/mi statutory standard went into effect on schedule. (Author abstract modified)

57468 **APTIC NO. 81402**

Epstein, Samuel S.

THE PUBLIC INTEREST: OVERVIEW. *Environ. Health Perspect., vol. 10:173-179, April 1975. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

The concept of public interest is discussed in relation to public interest groups. The flow of much critical information operates on a closed-loop basis within any industry and between closely interrelated industries. Claims for confidentiality of industrial data should be validated by the EPA Office of General Counsel to determine that the data are in fact secret within terms of the Freedom of Information Act. The EPA probably does not need further legislation to obtain all the information it requires from industry. A particular concern of public interest groups and technological echelons in the EPA has been the repeated refusal of industry to supply emissions data and data on emission control systems on certification fleets for 1975 cars. When public representatives cannot obtain access to basic data relevant to the decision making process, major policy choices are partially or completely dictated by the major vested interests which control the data. The basis for a low public opinion of the automobile industry appears well supported by recent episodes. Conspiracy to restrain the development and marketing of auto exhaust control systems and illegal control defeat devices are described. Distortion and manipulation of information and monopolistic practices involving the stratified charge engine are discussed. The public interest movement amply recognizes the tradeoffs involved between needs to control hydrocarbons, carbon monoxide, and oxides of nitrogen and the risk of adverse effects of nonregulated emissions from converters: sulfates, platinum, and palladium. The critical evaluation of such tradeoffs clearly requires free access to the underlying data base. The economic advantages of the converter to the industry and the need to prevent further erosion of the Clean Air Act are both so compelling that it is now certain that the converter will be marketed for the next few years in spite of a wide range of serious unresolved questions. It thus seems essential to impose strong limitations on the converter market in order to limit the commitment and to ensure further regulatory flexibility. The first and most critical need of public interest groups is for free access to data. Citizens and consumers and those representing them are virtually excluded from anticipatory involvement in decisions vitally affecting them. Independent research on alternative power systems should be developed. The EPA appropriations and resources are inadequate for the discharge of their mandated responsibilities in air pollution control.

57469 **APTIC NO. 81327**

Ford, Andrew

ENVIRONMENTAL POLICIES FOR ELECTRICITY GENERATION: A STUDY OF THE LONG-TERM DYNAMICS OF THE SO2 PROBLEM. *Energy Syst. Policy, 1(3):287-304, 1975. 24 refs.*

A dynamic model has been constructed to determine the likely severity of the restrictions on coal use in power plants and to analyze the effectiveness of alternative political, economic, and technical policies designed to reduce the severity of the sulfur dioxide constraint. Endogenous variables in the model include economic costs, perceived damage from SO2, reliability of stack gas abatement technologies, investment in scrubbers, society's clean air goal, substitution of investment between coal and oil and gas, and sulfur content regulation. Simulations indicate that retrofitting coal plants with scrubbers is effective in reducing both SO2 emissions and utility demand for oil and gas. Reducing SO2 emissions to values below the 1950 value will require the development and implementation of abatement technologies such as fluidized bed combustion, gasification, or solvent refining, which are more efficient than scrubbers. Conservationist policies that reduce the growth in the demand for electricity not only reduce SO2 emissions but also lower oil and gas requirements to levels below the levels achieved by relaxing sulfur content regulations. Results of a slowdown in nuclear power plant construction were also investigated. (Author abstract modified)

57470 **APTIC NO. 77480**

Freeman, L. Russell

CALIFORNIA. APPROVAL AND DISAPPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(121):26278-26279, June 23, 1975.*

A proposal by the Environmental Protection Agency to approve certain compliance schedule revisions to the California implementation plan is presented. Each proposed compliance schedule revision establishes a new date by which the individual air pollution source must comply with an emission limitation specified by the implementation plan. In some cases the schudule includes incremental steps towards compliance with the specified regulations. Seven of the schedules (including one schedule which was revised) and parts of two additional schedules have expired and the affected sources are now required to be in compliance with the applicable air pollution control regulations. Therefore, the EPA takes no action with regard to the appropriate portions of compliance schedules submitted for these sources.

57471 **APTIC NO. 81568**

Fujii, Masami

ATMOSPHERIC DIFFUSION SIMULATION CALCULATIONS. *(Taiki kakusan shimyureshon keisan). Text in Japanese. Nippon Yakuzaishikai Zasshi (J. Japan Pharm. Assoc.), 27(9):49-54, Sept. 1975.*

Environmental terms are explained succinctly in layman's language. The merits and pitfalls of environmental assessment by simulation calculations are pointed out. Environmental surveys for formulation of diffusion calculations for use in total emission regulations cost at a minimum, $100,000 for meteorological surveys and $67,000 for calculation costs, when regions with industrial complexes are involved. Twice those amounts would be desirable, but spending more money than that does not necessarily result in more scientific data. Averages and approximations abound in simulation calculations. Selection of most suitable parameters by those competent in the field is a necessity. Computer firms without expertise in the environmental field would produce worthless environmental assessments: garbage in, garbage out. In diffusion calculations at the ground level, shifts in wind direction, unless affected by topographical conditions, are relatively unimportant, compared to changes in wind velocities. In Japan, as a safety factor, diffusion calculations do not take into account the weakening of SO2 effects by photodecomposition, or purification by rain. The correctness of this interpretation is not known at present, because diffusion equations are formulated according to observed ground values (ppm).

57472 **APTIC NO. 77817**

Gilbert, T.

CURRENT CRITERIA FOR THE CONDITIONS FOR THE EMISSION OF GASEOUS FLUORIDE COMPOUNDS FROM BRICKWORKS. *(Aktuelle Bewertungsmassstaebe fuer die Bedingungen der Emission gasfoermiger Fluorverbindungen aus Ziegeleien). Text in German. Ziegelind. (Weisbaden), no. 4:139-141, April 1975. 3 refs.*

Emissions criteria for gaseous fluoride compounds generated by brickworks are reviewed as set forth in the Federal German Emission Control Law. A general emission limit of 30 mg fluoride/cu m flue gas is specified at 3% carbon dioxide, a temperature of 273 K, and a pressure of 1013 millibar. Gaseous fluoride emissions of up to 200 mg/cu m exist at various brickworks in North Rhine Westphalia where special control measures are not being used. Over 50% of these uncontrolled operations are emitting fluorides at levels of over 30 mg/cu m. Emission values for hydrogen fluoride are also specified by the clean air regulations.

57473 **APTIC NO. 77794**

Hongo, S.

OBSERVATIONS ON ENVIRONMENTAL ASSESSMENT (2). ON-THE-SPOT REPORT. PRESENT STATUS OF ENVIRONMENTAL ASSESSMENT IN VARIOUS REGIONS OF JAPAN. *(Kankyo asesumento o kangaeru (2). Genchi rupo. Nihon kakuchi no kankyo asesumento no genjo). Text in Japanese. Ao to Midori (Blue Green), 4(3):37-41, March 1975.*

The importance of environmental assessment in planning industrial location and expansion and in formulation of public works projects is discussed. Cases under discussion are the Yokkaichi Pollution Trials, industrial pollution of Seto-Naikai (Inland Sea of Japan), and construction of a new airport by filling in part of Osaka Bay. The Yokkaichi Industrial Complex, which had its beginnings in 1955 on former Japanese Navy property, is a prime example of industrial development accompanied by heedless environmental destruction. By 1973, industrial shipments totalled $2 billion. From 1960 to 1967, the average semi-annual concentrations of sulfur oxides ranged from 0.05 ppm to 0.14 ppm, with a maximum at one time of 2.5 ppm. Respiratory cases increased yearly. The verdict of the pollution trials, handed down on July 24, 1972, was in complete favor of the nine plantiffs, all victims of pollution-caused diseases. Corporate responsibility was specified in the judgment. Heavy industries were located along the shore of Seto-Naikai by filling in offshore and utilizing former farmlands and salt fields. By 1971, industrial shipments totaled more than $83 billion. Disregard of topographical and oceanographic considerations resulted in air and water pollution, destruction of the fishing environment, and damage to the natural beauty of the area, famous worldwide. Environmental assessment has been used to postpone construction of a new airport near Osaka. The Environmental Agency felt there was insufficient impact study of noise, traffic, air and water pollution, tidal current changes, and where landfill material was to be obtained.

57474 **APTIC NO. 81500**

Hosler, Charles R.

THE METEOROLOGY PROGRAM OF THE ENVIRONMENTAL PROTECTION AGENCY. *Bull. Am. Meteorol. Soc., 56(12):1261-1270. Dec. 1975. 36 refs.*

The Environmental Protection Agency's air pollution meteorology program administered by personnel from EPA and by personnel on assignment to the EPA from the National Oceanic and Atmospheric Administration is described. The program consists of two general areas of activity: research activities aimed at defining and describing meteorological factors of prime importance to air pollution control and abatement and operational support activities which apply meteorological principles to air pollution control programs. Current research activities on air quality simulation modeling, the Regional Air Pollution Study in the St. Louis area, geophysical studies, and air pollution potential climatology are reviewed. (Author abstract)

57475 **APTIC NO. 81211**

Jublot, R. M. and E. Goulley

EMISSION CONTROL POLICY OF AUTOMOBILE EXHAUST IN EUROPE. *(Yoroppa ni okeru jidosha haiki no haishutsu boshi taisaku). Text in Japanese. Doryoku (Nihon Doryoku Kyokai Kaiho) (J. Japan Power Assoc.), 25(32):84-92, 1975.*

Automobile exhaust problems in Europe occurred much later than in the U. S., due to less automobile traffic, less exhaust, less consumption of automobile fuel (about 1 ton fuel/car/year, compared to 2 ton in the U. S.). Greater Los Angeles and Paris have about the same area, but Paris consumes much less automobile fuel. Long-range policy has been established for France and Italy. Lead additions to gasoline will be gradually reduced to O, although it is impossible to produce lead-free gasoline without reducing its octane. If automobiles equipped with catalytic coverters are to be run, gasoline with a RON 93/94 octane will be used. Consumption of gasoline in Europe, presently nearly 600 million ton, will eventually reach 1000 million ton, even taking into consideration the slackening demand for gasoline. The rate of increase in gasoline consumption will slow down as automobile manufacturers produce smaller cars, with smaller fuel needs, and joint transporation systems will spread in urban areas. The steps taken to control air pollution for 1975 and 1976 (gasoline sold in the Common Market as of Jan. 1, 1976 is to contain 0.40 g/l lead, to be reduced to 0.15 g/l by Jan. 1, 1978) will be adequate for the coming 10 years. In 1985, nuclear energy will be developed and there will be much electrification of both industry and homes. However, consumption of petroleum goods will still increase, as demands by the transportation and chemical industries will increase, requiring much more stringent policy.

57476 **APTIC NO. 81320**

Liff, Sally D. and Salvatore J. Bellomo

LAND USE AND TRANSPORTATION ISSUES IN ENVIRONMENTAL CONTROL. *Environ. Health Perspect., vol. 10:249-256, April 1975. (Presented at the Conference on Biometeorological Consequences of Environmental Controls, Research Triangle Park, N. C., May 14-15, 1974.)*

The effect of land use and transportation planning on environmental pollution is illustrated at the regional level for a proposed highway development around Baltimore, Maryland. The findings for both short-term and long-term effects of alternative transport policies are summarized with respect to population and employment, economic indicators, traffic and travel, air quality, water and solid waste, noise, and environmentally sensitive areas. The construction of an interstate highway system and the implementation of a general road improvement program in the area are not expected to result in any violations of the carbon monoxide air quality standard after 1980. However, a continuation of hydrocarbon level violations primarily due to the growth of stationary rather than mobile source pollution is expected along with a violation of the photochemical oxidant standard for some time between the present and 1995. The findings hinge on the effective implementation of the Federal motor vehicle emission controls for new vehicles.

57477 **APTIC NO. 81405**

Moran, John B.

CONFERENCE OBJECTIVES. *Environ. Health Perspect., vol. 10:5-8, April 1975. (Presented at the Conference on Health Consequences of Environmental Controls: Impact of Mobile Emissions Controls, Research Triangle Park, N. C., April 17-19, 1974.)*

The past and current Environmental Protection Agency (EPA) research and regulatory programs as they relate to nonregulated emissions from light-duty motor vehicles are reviewed. Provisions of Sections 202(a) and 211 of the 1970 Clean Air Act Amendments are discussed and their relationships to the nonregulated emissions issue detailed. The EPA position regarding nonregulated emissions from oxidation catalyst-equipped vehicles is discussed and related to catalysts, measurement methods, and control options. (Author abstract)

57478 **APTIC NO. 74801**

Mutsuguchi, Jun

OBSERVATIONS ON ENVIRONMENTAL ASSESSMENT (3). ON-THE-SPOT REPORT. ENVIRONMENTAL ASSESSMENT IN TOMAKOMAI. *(Kankyo asesumento o kangaeru (3). Genchi rupo. Tomakomai no kankyo asesumento). Text in Japanese. Ao to Midori (Blue Green), 4(3):42-47, March 1975.*

Deficiencies in application of environmental assessment to future industrial development in Tomakomai, Hokkaido, Japan, are described. On January 12, 1974, the go-ahead was given to development of the Eastern Tomakomai Industrial Region through 1974. Adverse economic conditions since the 1973 oil crisis have caused delay in start of such major projects. Reexamination of the Tomakomai go-ahead decision is urged. Environmental assessment reports on which the decision had been based are defective because of poor data and insufficient thought and foresight. Strong negative public opinion on the industrial development has materialized. Hokkaido has already bought 96% of the land (about 10,000 hectares) for industrial use at a cost of $100,000,000. The master plan envisioned completion of the complex in the mid 1980 s, with projected figures including a 600% increase in electric power and a 400% increase in oil refining. At present, 2500 hectares have been developed, with electric power (1 million kW), oil refining (250,000 barrels/day), and aluminum production (3.6 million tons/year). The modest 1978 projections by Tomakomai City, including a 10% increase in electric power and a 30% increase

in oil refining, would result in grossly underplanned pollution control measures when the complex is completed.

57479 **APTIC NO. 81228**

Nihei, Hisao

ON NOX POLLUTION IN TOKYO AND ABATEMENT PROGRAMS. *(Tokyo-to ni okeru NOx osen to sakugen keikaku ni tsuite). Text in Japanese. Kogai To Taisaku (J. Pollution Control), 11(11):1219-1228, Nov. 1975. 3 refs.*

The status of nitrogen oxides pollution in Tokyo, and measures for NOx abatement are discussed. Since 1973, nitrogen dioxide concentrations have increased yearly. Only 51-53 days in 1973 met environmental standards for NO2 emission. In 1972, total NOx emissions in Tokyo amounted to about 96,000 tons/year, of which 70% were from transient sources (along major roads) and 30% from stationary sources (along Tokyo Bay). In Tokyo, interim NOx standards for 1977 include a yearly average NOx value of 0.015 ppm, while 90% or more days of the year must show a daily average NOx value below 0.02 ppm. By 1977, projected total NOx emissions from stationary sources (33,000 tons/year) should be reduced by 11,000 tons/year (boiler emission improvements) and NOx emissions from transient sources (91,000 tons/year) by 56,000 tons/year. Another 1000 tons/year should be reduced by such measures as decreasing traffic volume. By 1977, stack denitrification equipment of 90% efficiency must be installed in factories using more than 3000 l/day of fuel. Boilers with less than 40 sq m of heat conduction surface area should reduce NOx emissions to 80 ppm. Various industrial furnaces should reduce emissions by 50%. With nitrogen content of fuel about 200 ppm, formation of fuel NOx (7%) can be ignored. At nitrogen content above 2000 ppm, fuel NOx concentrations for 66-111 ppm are possible. Both thermal and fuel NOx suppression are necessary to attain NOx emission of 80 ppm.

57480 **APTIC NO. 74848**

Okamura, H.

THE RECESS OF 76 REGULATIONS ON AUTOMOBILE DISCHARGE GASES AND TECHNICAL LEVEL. *(Jidosha haigasu no 51 nen kisei no kotai wa tadashii gijutsuteki kento no ue ni nasareta ka). Text in Japanese. Gendai Kagaku (Mod. Chem.), no. 48:19-21, March 1975.*

The suspension of 1976 automobile exhaust standards is discussed. The 1976 regulations specify a total nitrogen oxide discharge of 0.25% g/km. The purpose of the regulations is to reduce the exhaust emissions by 1976 down to 1/10 of those in 1973. However, the regulations are going to be suspended. The temporary regulations will be 2.10 g/km carbon monoxide, 0.25 g/km for hydrocarbons, and 0.6 g/km for NOx. One method for reducing exhaust emissions employs the Honda stratified charge engine in which the air-fuel ratio is less than that of the equivalent ratio. This engine makes use of a preliminary combustion chamber installed around the ignition plugs. Although the maker of the engine declared that the gas discharge is 1.4 g/km for CO, 0.125 g/km for HC, and 0.5 g/km for NOx in May 1973, the data are not relied upon in Japan. Honda publicly reported in Japan that the driving performance of the stratified charge engine-equipped cars is not satisfactory.

57481 **APTIC NO. 81710**

Otto, Konrad

ENVIRONMENTAL PROTECTION OVERWHELMS CITIES. *(Umweltschutz ueberfordert Staedte). Text in German. Umwelt (Duesseldorf), 5(5):13-15, 1975. 5 refs.*

A survey conducted among municipalities in West Germany revealed that the cities are overwhelmed by environmental protection problems, especially in view of the recent Federal Environmental Protection Law. While medium and large towns are willing to accept even stricter environmental regulations, most of them do not have sufficient funds and experts to cope with the environmental problems. Therefore, many municipalities encourage the establishment of joint intercommunal organizations as advisory bodies for the communities. These organizations would be responsible for the investigation of the environmental compatability and impacts of new projects and measures.

57482 **APTIC NO. 77483**

Quarles, John

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. SOURCE SURVEILLANCE. *Federal Register, 40(120):26031-26032, June 20, 1975.*

Section 52.12 of 40 CFR is revised to indicate that compliance with Federally promulgated regulations regarding source surveillance for implementation plan requirements is to be tested by means of the methods and procedures set forth in Part 60 of the chapter unless otherwise specified in Part 52 of the chapter. The change does not impose any additional requirements on any source or source categories but rather corrects an existing inconsistency in the 40 CFR Part 52 regulations. The Environmental Protection Agency finds that good cause exists for not providing for notice and public comments on this action and for making it effective immediately upon publication.

57483 **APTIC NO. 78330**

Quarles, John

PART 15 -- ADMINISTRATION OF THE CLEAN AIR ACT AND THE FEDERAL WATER POLLUTION CONTROL ACT WITH RESPECT TO FEDERAL CONTRACTS, GRANTS, OR LOANS. *Federal Register, 40(74):17124-17128, April 16, 1975.*

The primary purpose of the program detailed here is to ensure that facilities in noncompliance with clean air and water standards are not utilized for Federal contracts, grants, or loans. Several of the major comments on the proposed regulations are discussed, including some that were not adopted. The comments that were adopted included changing the effective date for the implementation of the program to July 1, 1975, except for facilities giving rise to a Federal criminal conviction. The program provides for the establishment of a List of Violating Facilities which will reflect those ineligible for the award of a Federal contract, grant, or loan. Facilities will be listed upon a determination by the Environmental Protection Agency (EPA) of continuing or recurring noncompliance with clean air or water standards. State and local criminal convictions, civil adjudications, and administrative findings of noncompliance may serve as a basis for consideration of listing. In cases where a facility has been subjected to a state or local civil adjudication or administrative finding that such facility is in noncompliance with clean air or water standards, EPA shall consider listing at the request of the Governor.

57484 **APTIC NO. 78333**

Quarles, John

PART 85 -- CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. SUBPART H -- EMISSION REGULATIONS FOR NEW GASOLINE-FUELED HEAVY DUTY ENGINES. *Federal Register, 40(40):8482-8495, Feb. 27, 1975.*

Since numerous technical amendments have been made, the entire subpart of the Code of Federal Regulations applicable to gasoline-fueled heavy duty engines is included. The provisions apply to new gasoline-fueled heavy duty engines beginning with the 1974 model year. The procedure for certification, the records which manufacturers are required to keep, the data which manufacturers are required to submit, and the emission standards themselves are included. Test procedures are described, including fuel specifications, dynamometer operation cycle and procedures, sampling and analytical measurement of exhaust emissions, information to be recorded, calibration and instrument checks, and calculations.

57485 **APTIC NO. 81567**

Sawaragi, Yoshikazu and Saburo Ikeda

SYSTEM APPROACH TO THE ENVIRONMENTAL ISSUES. *(Kankyo mondai eno sisutemu apurochi). Text in Japanese. Preprint, Society of Instrument and Control Engineers, Tokyo, 8p., 1975. 7 refs. (Presented at the Determination of Environmental System and Modeling Symposium, Osaka, Japan, April 18, 1975.)*

Since the emergence of environmental pollution as a grave social problem in the latter half of 1960s, global scale environmental pollution has been investigated. The concept of an interdisciplinary systems approach to environmental pollution problems is described. Concepts of the global environment as a total system (natural system, living system, and social system) and a systems approach to environmental problems (interdisciplinary and single discipline approaches) are discussed. Systems approaches to environmental problems involve the definition of the object or goal, evaluation standards for the achievement of goals, plans for the achievement of goals, impact assessments of each plan on goal and decision making process, and monitoring and feed-back concerning results. Descriptions of a three-year project on environmental pollution control conducted by the Ministry of Education in Japan, and a systems approach to total control of environmental pollution developed by the U. S. Environmental Protection Agency are given.

57486 **APTIC NO. 81435**

Schulte, Heinz

IMPLICATIONS OF A VERDICT. *(Implikationen eines Urteils). Text in German. Energie (Munich), 27(9):217, 1975.*

An immediate halt to the construction of a coal-firing power plant was ordered by a court in Duesseldorf, arguing that in view of the present sulfur dioxide concentrations measured on part of the site, the SO2 concentrations would exceed the maximum allowable short-term SO2 concentration of 0.4 mg/cu m. However, the power plant was planned in compliance with the applicable regulations concerning air pollutant emissions, and, in the opinion of the Industrial Inspection, based upon a detailed clean air maintenance plan and the resulting measures to be taken, the maximum allowable concentration is expected to be reached only in the worst case. The court order is contrary to environmental concerns, as it may lead to the continued operation of obsolete power plants with substantially higher specific emissions, and also to the detriment of the basic economic requirements of the area affected.

57487 **APTIC NO. 77541**

Stoel, Thomas B., Jr., David F. Michelman, Karim Ahmed, and R. James Woolsey

A PETITION OF NATURAL RESOURCES DEFENSE COUNCIL FOR THE PROMULGATION OF A RULE DECLARING PRESSURIZED PRODUCTS CONTAINING CERTAIN FLUOROCARBON PROPELLANT COMPOUNDS TO BE BANNED HAZARDOUS PRODUCTS. *Chem. Technol., vol. 1975: 22-27, Jan. 1975. 37 refs.*

A Petition before the Consumer Product Safety Commission of the Natural Resources Defense Council for the Promulgation of a Rule Declaring Pressurized Products Containing Certain Fluorocarbon Propellant Compounds to be Banned Hazardous Products is presented. The petition summarizes scientific evidence that continued use of pressurized products containing dichlorodifluoromethane and trichloromonofluoromethane, and similar fluorocarbon compounds will expose many persons to the risk of death or serious illness. Continued use of pressurized products causes a reduction in the ozone level of the upper atmosphere, allowing more ultraviolet radiation to reach the earth. An increase in ultraviolet radiation results in a significantly higher incidence of skin cancer. Because no feasible consumer product safety standard adequately protects the public from the unreasonable risk of injury associated with the pressurized products containing the fluorocarbons, the petition requests the pressurized products be banned hazardous products. (Author summary modified)

57488 **APTIC NO. 76846**

Tanaka, Y.

ON THE INTRODUCTION AND ENFORCEMENT OF TOTAL EMISSIONS REGULATIONS FOR AIR POLLUTION IN CHIBA PREFECTURE. *(Chiba-ken ni okeru taiki osen no soryo kisei no donyu to jisshi ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(4):313-318, 1975.*

The major industrial development (e.g., petroleum and petrochemical complexes, and steelworks) is located along the eastern coastline of Tokyo Bay, from Chiba City to Kimitsu City. This region is known as the Keiyo Coastal Industrial Region. Near the Chiba-Tokyo border, around the Edo River (Ichikawa City, Funakabashi City, Urayasu City), small to medium-sized enterprises are located along the coastline and inland. Of the total pollutant emissions for 1973, about 92% of the sulfur oxides and about 87% of the nitrogen oxides were emitted from the Chiba- Ichihara and Kimitsu sections of the Keiyo Coastal Industrial Region. Total pollutant emissions for 1973 were: sulfur oxides, 14,942 N cu m/hr; nitrogen oxides (NO2), 12,450 N cu m/hr; dust, 3363 kg/hr. There was about 49% compliance with environmental standards for sulfur oxide emissions. Nitrogen dioxide levels, while above environmental standards, have remained nearly constant from 1971-1973, ranging from 0.008-0.041 ppm for average yearly values. Average yearly values for airborne particulates in 1973 ranged from 0.020-0.074 mg/cu m, with maximum hourly values ranging from 0.37-1.34 mg/cu m. Simulation studies have been conducted for the enactment of sulfur oxides control regulations in the Keiyo Region. No simulation techniques have yet been established for nitrogen oxides and dust. Maximum ground concentration for sulfur oxides per factory was set at less than than 0.003 ppm by the end of 1977. The amount of allowable regional emissions should be 7300 N cu m/hr at that time. Projected decreases in introgen oxides and dust for 1977 call for target concentrations of 4996 N cu m/hr for NOx, and 1139 kg/hr for dust, by law, but 6641 N cu m/hr for NOx, and 1962 kg/hr for dust, by industry.

57489 **APTIC NO. 76989**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. PREVENTION OF SIGNIFICANT AIR QUALITY DETERIORATION. *Federal Register, 40(114): 25004-25011, June 12, 1975.*

Minor amendments to the December 5th Environmental Protection Agency promulgation of final regulations for preventing the significant deterioration of air quality in relation to state implementation plans are presented. Although a general disapproval of all state implementation plans was set forth previously in section 52.21(a), specific disapprovals are incorporated into the applicable subpart for each state in Part 52; and the general disapproval statement of 52.21(a) is modified accordingly. Similarly, the specific requirements of paragraphs (c), (d), (e), and (f) in 52.21 for preventing significant deterioration are incorporated by reference into each subpart. The applicability provisions of 52.21(c) and (d) are also changed accordingly. Although these changes have no substantive effect, they are made so that all approval/disapproval actions and promulgations appear in the appropriate subpart designated for each state.

57490 **APTIC NO. 81132**

Train, Russell E.

TENNESSEE; CONTROL OF STATE-OWNED OR OPERATED SOURCES. APPROVAL AND PROMULGA-

TION OF IMPLEMENTATION PLANS. *Federal Register, 40(114):23025, June 12, 1975.*

The Tennessee State Implementation Plan for the national ambient air quality standards was disapproved to the extent that it does not provide for the regulation of air pollution sources owned or operated by the State. This situation exists due to a ruling that state agencies in Tennessee are not subject to local air pollution regulations unless the regulations mention them specifically, and that state agencies are not included in the definition of the term person in the Tennessee Code. A definition of person to be incorporated in the Tennessee plan is proposed, that would remedy the deficiency. Person would mean any individual, partnership, copartnership, firm, company, corporation, association, joint stock company, trust, estate, facility owned or operated by the State, State agency, political subdivision, or any other legal entity, or their legal representatives or agents.

57491 **APTIC NO. 81315**

Treshow, Michael

OVERVIEW: BIOLOGICAL CONSEQUENCES OF ENVIRONMENTAL CONTROL. *Environ. Health Perspect., vol. 10:215-222, April 1975. (Presented at the Conference on Biometeorological Consequences of Environmental Controls, Research Triangle Park, N. C., May 14-15, 1974.)*

An overview of the biological consequences of environmental control is presented. Topics covered include: the misinterpretation of environmental control programs, the effectiveness of using tall stacks to control pollution, the effects of pollutants like sulfur dioxide, sulfur trioxide, and photochemical oxidants on plants, natural ozone tolerances of plants, natural pollution sources, and the implementation of air quality standards. Specific examples of air pollution control efforts resulting in unforeseen and harmful effects are cited. Increased emissions of nitrogen oxides from automobiles as a result of hydrocarbon and carbon monoxide control is one example. Another is the creation of sulfuric acid mist emissions as a result of the use of catalytic converters on motor vehicles. The control of sulfide emissions from paper pulp mills by oxidation is cited as having resulted in increased sulfur dioxide levels.

57492 **APTIC NO. 81709**

Vogl, J.

PLANNING CONCEPTION FOR THE SETTLEMENT OF INDUSTRIES IN LINE WITH LOCAL IMMISSION CONDITIONS. *(Planerische Kozeption fuer die Ansiedlung von immissionsrelevanten Industrieanlagen). Text in German. Gesundh.-Ingr., 96(10):255, 1975. (Presented at the 3rd Symposium on Branch Specific Emissions, Emission by Oil Refineries and Petrochemical Plants, Bayerisched Landesamt fuer Umweltschutz, Munich, March 20-21, 1975.)*

The general concepts of land use and of siting industrial facilities in view of air pollutant emissions in Bavaria are presented. Abatement of the air pollutant emissions in highly polluted areas, and the prevention of any increase in the pollution level in recreational and other similar areas are the basic tasks in planning. Technological improvements in view of emission abatement are most important, and these improvements can be motivated best by imposing restrictions concerning the siting of industrial plants with respect to the background concentrations. Decisions on the siting and authorization of industrial plants are taken on the basis of an inventory list of existing emission sources and their emissions.

57493 **APTIC NO. 81318**

Willard, Beatrice E.

GUIDELINES OF THE COUNCIL ON ENVIRONMENTAL QUALITY FOR THE PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS. *Environ. Health Perspect., vol. 10:235-241, April 1975. (Presented at the Conference on Biometeorological Consequences of Environmental Controls, Research Triangle Park, N. C., May 14-15, 1974.)*

Guidelines of the council of Environmental Quality for the preparation of environmental impact statements are reviewed. The CEQ guidelines are based on Title 1, Section 101 of the National Environmental Policy Act. Reasons for initial delays in the implementation of the NEPA by federal agencies are discussed, and significant progress in reducing such delays is cited. The consideration of alternative environmental actions and the balancing of short-range resource commitment versus long-range values of resources are emphasized in the evaluation of potential environmental impacts.

57494 **APTIC NO. 81399**

Yamashita, Shuji

ADMINISTRATIVE STEPS. *(Gyosei taio). Text in Japanese. Preprint, Japan Society of Air Pollution, Tokyo, p. 222-230, 1975. 11 refs. (Presented at Japan Society of Air Pollution Annual Meeting, 16th Niigata, Japan, Nov. 5-7, 1975, Paper 9513.)*

The Niigata Prefectural Administration s policy for environmental pollution, primarily fluoride emissions from the aluminum refineries in the Joetsu area, is discussed. The Joetsu area comprises the Noetsu littoral industrial belt, chiefly heavy chemical industries. The major gaseous fluoride emission, 67 kg F/day, is traceable to the electrolytic furnaces of the aluminum refining process. Legal regulations for fluoride emissions control include the Niigata Prefectural Environmental Pollution Act of January 1970, the Air Pollution Prevention Act of the Ministry of Health and Welfare and the Ministry of International Trade and Industry, promulgated in June 1971, and the Niigata Prefectural Ordinance 52 of December 1971. Agricultural damage has been significantly and rapidly increasing since the aluminum refineries started their operation in the Joetsu area in May 1963, and the cause of the damage has been determined to be fluoride contamination of the air. After several revisions of the regulations for fluoride emissions control, the mean value of the fluoride emission is now restricted to below 1.3 microgram F/cu m/10 day, and the agricultural conditions are gradually improving.

57495 **APTIC NO. 81210**

Yoshikawa, T.

RESULT OF SURVEY ON PHOTOCHEMICAL AIR POLLUTION. *(Kokagaku taiki osen no chosa kekka to gaiyo). Text in Japanese. PPM (Japan), 6(8):57-68, Aug. 1975.*

It is necessary to be able to make photochemical smog forecasts precisely. Models are being developed for estimating oxidants by simulation methods. Since summer, 1975, at two sites each in Tokyo, Osaka, and the Seto Inland Sea area, three-dimensional observations of temperature and wind have been periodically made by low-strata radiosonde and pilot balloon, to help each prefectural government anticipate extraordinary photochemical smog. Data from monitoring stations on the ground and from atmospheric observation will be fed into a computer in the future, and by using a forecasting system with a photochemical reaction model, emission sources will be controlled. Between 1972 and 1974, physical and chemical measurements of photochemical smog pollution were made in the Osaka Bay and Tokyo Bay areas, and the possibility of forecasting by a simulation method was studied. It was found that it is necessary to improve technology to eliminate nitrogen oxides and hydrocarbons from both mobile and stationary sources, eliminate components of HC which cause photochemical reactions, establish methods of measuring photochemical smog from mobile sources, establish more monitoring sites for HC, and improve methods of forecasting local meteorological phenomena.

57496 **APTIC NO. 75459**

Abcor Inc., Cambridge, Mass., Walden Research Div.

MODELING ANALYSIS OF POWER PLANTS FOR EVALUATION OF IMPACT OF AMBIENT SO2 CONCENTRATIONS. SOUTH CENTRAL COAST AQCR 32. *Office of Air and Waste Management Contract, 22p., Jan. 1975. 2 refs.*

Diffusion modeling analyses of sulfur dioxide emissions from the Morro Bay thermal power plant located in the South Central Coast Air Quality Control Region (California) are presented as part of an effort to determine the air quality impact of changes in fuel use and possible compliance schedule extensions. Emissions under both nominal and maximum load operations from the plant result in contributions to ambient air concentrations which by themselves do not exceed the primary 24-hour SO2 standard. The values for the ratio of the ambient SO2 concentration to the emission rate of the plant, in micrograms/cu m per g/sec, are 0.78 and 0.47 for nominal and maximum loads, respectively, on maximum concentration days. These values indicate the relative pollution potential of the plant.

57497 **APTIC NO. 76643**

Japan Society of Air Pollution

SPECIAL ISSUES ON THE AUTOMOTIVE EXHAUST EMISSION CONTROL IN 1976. *(Showa 51 nendo jidosha hiashutsu gasu kisei mondai tokushu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(1):1-50, 1975.*

The special issue contains the following reports of various governmental agencies: the progress report on establishing long-range threshold limit for automotive exhaust emission submitted in Oct. 1972 by the Central Pollution Control Council; the report on 1976 automotive exhaust emission control submitted in Dec. 1974 by thee Central Pollution Control Council; the report on 1976 automotive exhaust emission submitted in Dec. 1974 by the Automobile Pollution Control Committee, Dept. of Atmosphere, Central Pollution Control Council; the report on the evaluation of techniques for reducing nitrogen oxides emission from automobiles submitted in Dec. 1974 by the Automobile Pollution Control Committee; Dept. of Atmosphere, Central Pollution Control Council; the survey report on automotive exhaust emission control in the seven largest cities submitted in Oct. 1974 by the specially appointed survey group; and explanatory materials concerning the 1976 automotive exhaust emission control submitted by the Dept. of Agriculture, Environmental Agency.

1974

57498 **APTIC NO. 81283**

Inhaber, H.

ENVIRONMENTAL QUALITY: OUTLINE FOR A NATIONAL INDEX FOR CANADA. *Science, vol. 186:798-805, Nov. 29, 1974. 40 refs.*

The development of a national environmental quality index for Canada is reviewed, with particular emphasis on the air quality subindex. The environmental quality index is broken down into four subindices dealing with air, water, land, and miscellaneous sections. The air quality index in turn consists of three subindices: an index of specific pollutants in urban areas (sulfur dioxide, suspended particulates, coefficient of haze, nitrogen oxides, total oxidants, and carbon monoxide); an index of interurban air quality based on visibility readings at airports; and an index of industrial emissions (mainly rural) which is concerned with sulfur oxides and suspended particulates. The three components of the overall air quality index are combined by the root-mean-square technique, with weights being assigned to reflect the approximate importance of each index to the overall Canadian air quality index.

57499 **APTIC NO. 73076**

Meyers, Sheldon

ENVIRONMENTAL IMPACT STATEMENT REQUIREMENTS AS RELATED TO FUEL CONVERSION TECHNOLOGIES. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 21-23, Oct. 1974.*

The National Environmental Policy Act of 1969 is discussed in relation to the Environmental Impact Statement (EIS) requirement. All agencies of the Federal government must include in every recommendation or report on proposal for legislation and other major Federal actions significantly affecting the quality of the human environment a detailed statement by the responsible official on the environmental impact of the proposed action. The effectiveness of EIS s has been variable. There have been a number of court decisions, such as Calvert Cliffs, Gillham Dam, and Kalur which have drastically affected the internal operations of a number of Federal agencies. The EIS can be used in a project s formulative states in much the same manner as is technical and economic information. It is in the planning stages of a project that the EIS will prove its ultimate usefulness as a mechanism for protecting the environment.

57500 **APTIC NO. 78465**

Papai, Laszlo, Laszlo Preszler, and Lajos Hirsch

A GENERAL SURVEY OF THE INVESTIGATIONS CONNECTED WITH INDUSTRIAL CYCLONE DUST COLLECTORS AND DUST MEASUREMENTS. *(Az ipari porlevalasztassal es pormeressel kapcsolatos hazai kutatasok). Text in Hungarian. Musz. Tud., no. 49:247-255, 1974. 54 refs.*

The state of research and development in the area of industrial dust separation and dust measurement in Hungary is reviewed. Despite the development of centrifugal, wet-type, and electrostatic dust separators, the development in the area of dust separation and measurement techniques lags behind the actual needs dictated by increasing dust emissions. This adverse situation is due to insufficient funds and to the lack of coordination and information in research and development. At present, no research activity is financed from the National Clean Air Maintenance Funds created from the contributions and fines paid by polluting industrial plants. The development of high- efficiency dry dust separators, technical and economical optimization of dust separators, and studies on the treatment and recovery of separated dusts will be the most important tasks in the immediate future. Research and development will have to be coordinated and possibly centralized.

57501 **APTIC NO. 78371**

Toyonaga, Masaru

AIR POLLUTION CONTROL AND TOTAL VOLUME CONTROL CRITERIA. *(Taiki osen boshi to soryo kisei ni tsuite). Text in Japanese. Preprint, the Chemical Society of Japan, Iwakuni City, p. 8-13, 1974. (Presented at the Chemical Society of Japan, Study Meeting on Progress of Environmental Chemistry, Iwakuni City, Japan, Sept. 17, 1974.)*

On June 1, 1974, by Law 65, one section of the present atmospheric pollution control regulations was revised, so that the total amount of pollution could be calculated whenever pollution controls are imposed. The law will go into effect in April 1975. The basic premises underlying the regulation by the total amount of pollution are as follows: in a given region, the maximum amount of a particular atmospheric pollutant detrimental to the health of the inhabitants is calculated according to a set chemical method, with consideration of meteorological and topographical conditions, and the status of the pollution sources; the sum of the pollutant levels from the various regional pollution sources must be within the range of the maximum amount specified above. Regulation by pollution concentrations becomes inadequate when there is such an increase in pollution sources that the total amount of pollutant becomes excessive, although there is compliance with concentration standards at each pollution source. The development of national pollution standards and method of implementation of the new regulation are also discussed.

57502 **APTIC NO. 81587**

Trijonis, John C.

ECONOMIC AIR POLLUTION CONTROL MODEL FOR LOS ANGELES COUNTY IN 1975. GENERAL LEAST COST-AIR QUALITY MODEL.. *Environ. Sci. Technol., 8(9):811-826, Sept. 1974. 20 refs.*

An economic air pollution control model is formulated for determining the least cost of reaching various air quality levels. The model takes the form of a general, nonlinear, mathematical programming problem. The two basic inputs to the model are the least cost of attaining various emission levels and the relationship between emission levels and air quality. A linear programming submodel is presented for deriving the first input, the control cost-emission level relationship. Empirical- statistical air quality submodels are outlined for obtaining the second input, the emission level-air quality relationship. The model is applied to the control of photochemical smog in Los Angeles County in 1975. Emission levels are specified by the average tons/day emissions of reactive hydrocarbons and nitrogen oxides. Air quality is specified by the expected number of days per year that oxidant (ozone) and nitrogen dioxide levels excees the California 1-hour state standards. The baseline for additional control policies is the 1975 emission level with the present Federal new car control program and with other sources having the degree of control existing in 1971. The least cost of reaching various emission levels is found by applying linear programming to 23 major source types and 31 potential add-on controls. (Author abstract modified)

57503 **APTIC NO. 73167**

Wixson, Bobby G.

DEVELOPMENT OF A COOPERATIVE PROGRAMME FOR ENVIRONMENTAL PROTECTION BETWEEN THE LEAD-MINING INDUSTRY, GOVERNMENT AND THE UNIVERSITY OF MISSOURI. *Preprint, Inst. of Mining and Metallurgy, Inst. of Quarrying, and Inst. of Mining Engineers, 9p., 1974. 12 refs. (Presented at the Minerals and the Environment Symposium, London, England, June 4-7, 1974, Paper 3).*

The development and application of a cooperative program between the lead mining industry, Federal government, and the University of Missouri for the control of air pollution are discussed. A working partnership was developed with the University serving as an unbiased intermediary between agencies and industry which allowed environmentalists to work with industrial and agency representatives to expose and resolve problems for social and economic benefits. During the summer of 1970, discoloration or bronzing was noticed in the new growth on the top of trees downwind from a smelter stack. It was established that excessive sulfur dioxide and acid mist emissions from the smelter were the cause of the premature tree browning. A higher than background pattern of sulfur and lead in soil and vegetation was noticeable immediately around the smelter. Recommendations for the control of these problems were made by the University to the industry. Four permanent SO2 ambient monitoring stations were installed at a cost of $50,000 and a fifth station is planned. Whenever the SO2 ambient level at any station exceeds the Missouri one-hour ambient standard (0.25 ppm) for more than 10 min, the sinter/acid plant is shut down.

57504 **APTIC NO. 77389**

Saitama Prefectural Government

PRESENT SITUATION AND COUNTERMEASURES: AIR POLLUTION. *Genkyo to taisaku: Taiki osen). Text in Japanese. In: 1974 Environmental White Paper, p. 35-84, Dec. 1974.*

The sorry state of air pollution in Saitama Prefecture, Japan, is described. There is a tendency toward reduction of sulfur oxides, but only 23% of the measurements met environmental standards in 1974. Concentrations of nitrogen oxides did not meet daily average environmental standards (0.02 ppm) on 80-90% of the days. Levels of carbon monoxide and adverse effects of photochemical smog in Saitama Prefecture are among the highest in Japan. Automobile ownership has jumped from 395,886 vehicles in 1968 to 908,851 in 1973. Automotive emission control measures are urgently needed. In 1972-1973 in Saitama Prefecture, 95.5% of sulfur dioxide emissions were associated with combustion of heavy oil. When separated into sources, amounts of sulfur dioxide emissions were allotted as follows: pulp and paper manufacturing, 20.2% (8786 tons/yr); ceramic industry, 15.6% (6836 tons/yr); steel industry, 10.8% (4726 tons/yr); and food processing, 10.7% (4680 tons/yr). From April to October 1973, there were more than 200 warnings and alerts on photochemical smog. Complaints totaled 6678. Up to 1972, occurreace of photochemical smog was more or less restricted to a set locality, but in 1973, smog warnings for an entire region were announced more frequently. Damage due to photochemical smog has been reported for morning glory, onion, tobacco, radish, turnip, peanut, taro, soy bean, and corn. Airborne particulates have been measured by digital impactors, high volume, and low-volume samplers. For average yearly values based on hourly values, high values ranged from 0.107 mg/cu m to 0.132 mg/cu m. Amounts of precipitated soot have decreased yearly since 1971 in conformity with national trends, and average values in 1973 for 5 monitoring stations ranged from 7-13 tons/sq km/day. On-site pollution inspections have been conducted; telemetry systems and pollutant warning systems have been established. The improvement of cupolas in foundries to decrease emissions of sulfur oxides and soot has been in progress.

57505 **APTIC NO. 81188**

ALARM AT THICK AIR. THE FIRST FULLY AUTOMATIC AIR MEASUREMENT SYSTEM OF EUROPE OPERATES. *(Alarm bei dicker Luft. Das erste vollautomatisierte Luftmesssystem Europas arbeitet). Text in German. Tech. Umweltmag., (6):28-29, Nov./Dec. 1974.*

The first step of the Bavarian air quality monitoring network, put into operation recently, is described. The fully automatic monitoring and alarm system is composed of 14 sampling stations in Achaffenburg, Augsburg, Erlangen, Fuerth, Imgolstadt, Kelheim, Munich, Nuernberg, Regensburg, and Wurzburg, with a computer center in Munich. Sulfur dioxide, carbon monoxide, hydrocarbons, dustfall, and dust concentration are monitored at all stations, while hydrogen sulfide is measured at 3 stations. Different meteorological parameters are monitored at 8 stations. The readings are recorded by a small computer at the sampling stations, and the 30-minute averages are transferred to the center via telephone lines at a rhythm that is dependent on the evolution of the pollution levels. The smog alarm is released automatically on the basis of the readings and of long-term monitoring. Restriction of the use of automobiles and certain equipment, and restriction or temporary prohibition of the use of certain fuels are envisaged for the case of alrm under certain inversion conditions in industrial and residential areas. When completed, the monitoring network is to include some 80 fully automatic sampling stations for the measurement of 24 hygienically relevant parameters.

1973

57506 **APTIC NO. 75416**

Walden Research Corp., Cambridge, Mass.

MODELING ANALYSIS OF POWER PLANTS FOR COMPLIANCE EXTENSIONS. E. CENTRAL ILL. AQCR 66. *Office of Air and Water Programs Contract, 28p., June 28, 1973. 2 refs.*

Diffusion modeling analyses of sulfur dioxide emissions from the Vermillion power station and the Abbott power plant located in the East Central Illinois Air Quality Control Region are presented as part of an effort to determine the air quality impact of proposed variances for meeting implementation plan requirements in the face of a low-sulfur coal supply deficit. Attainment of the 24-hour and annual primary air quality standards does not appear to be jeopardized in the region under implementation plan regulations. The projected average sulfur content of coal used by power plants in the region is 2.8% under implementation plan regulations. The coal sulfur content used at these plants in 1971 was below implementation plan regulations. (Author conclusions modified)

GENERAL

1975

57507 **APTIC NO. 74287**

Roffman, H. and M. C. Bender

HYDROGEN SULFIDE: NEW SOURCES AND POTENTIAL IMPACTS. *Preprint, Air Pollution Control Assoc., Pitssburgh, Pa. 20p., 1975. 24 refs. (Presented at the Air Pollution Control Association Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-46.1.)*

Major industrial sources of hydrogen sulfide include coking industries, smelters, chemical plants, and vegetable and animal processing industries. Coupled with these sources are natural phenomena, including slow decomposition of organic matter in swamps and volcanic eruptions. The search for new energy source has led to the development of coal gasification processes and previously untapped geothermal resources, both of which emit hydrogen sulfide into the atmosphere. Laboratory work and case studies concerning the effects of varied concentrations of hydrogen sulfide in the air on plants, animals, and man are reviewed; state and federal applicable standards are summarized; and techniques of hydrogen sulfide removal are described. For man and animals, paralysis of the respiratory system occurs at a concentration of hydrogen sulfide of greater than or equal to 700 ppm. Concentrations of 70 to 300 ppm cause irritation of the respiratory tract, mucous membranes and eyes, as well as excitement of the nervous system. Irritability, vomiting, dizziness and fatigue accompany continuous exposure to levels of hydrogen sulfide of less than 25 ppm. Hydrogen sulfide injury to vegetation appears to be a function of turgidity of the cells and increasing temperatures. Hydrogen sulfide removal technology is available, and emissions under normal operating conditions can be controlled within environmentall acceptable ranges. (Author abstract modified)

57508 **APTIC NO. 78030**

Te Brake, William H.

AIR POLLUTION AND FUEL CRISES IN PREINDUSTRIAL LONDON. *1250-1650. Technol. Cult., 16(3):337-359, July 1975. 93 refs.*

A historical review of air pollution and fuel crises in preindustrial London (1250-1650) is presented. The occurrence of air pollution during this period is shown to be symptomatic of a basic environmental problem that exists in toady s industrial society, viz., the exhaustion of a society s preferred source of fuel (wood) and difficulty in finding an adequate substitute (sea coal). The problem of preindustrial London is also discussed in connection with demographic and economic developments within that society.

1974

57509 **APTIC NO. 74401**

Kyoto City (Japan)

DATA FROM POLLUTION STUDIES. *(Kogai chosa shiryo). Text in Japanese. 56p., Oct. 1974.*

Data from 1973 studies on pollution (air, water, noise, and vibration) are summarized. Although total heavy oil consumption was 1.05 million kl in 1973, the highest in 10 yr, average sulfur oxides concentration dropped to 0.33 mg/100 sq cm/day, the lowest during that time, from the maximum value of 0.85 mg/100 sq cm/day reached in 1969. The changes in types of heavy oil consumed correspond to this decrease. No SOx alerts were issued in 1973. Maximum hourly concentrations of nitrogen oxides for 1973 ranged from 0.3-0.91 ppm; average yearly concentrations ranged from 0.05-0.17 ppm, depending on monitoring location. Average yearly values of airborne particulates (about 0.06 mg/cu m) and precipitated particulates (4.0 tons/sq km/month) did not change from 1972 to 1973. Of 3403 vehicles checked on the streets in 1973 and 1974, 31.4% violated carbon monoxide emission standards. Exhaust emissions of CO in 1973 ranged from 2.4-6.6 ppm in a survey from 6 monitoring locations. There were 10 photochemical smog alerts issued during 1973, compared to one in 1972. Maximum oxidant concentrations during the alerts ranged from 0.08-0.23 ppm. Concentrations of atmospheric n-pentane in a section of Kyoto ranged from 52-200 ppb, compared to atmospheric n-pentane concentrations of 17.0-60.0 ppb in Los Angeles. Ozone and other organic compound concentrations in Los Angeles were higher. Extensive mercury and polychlorinated biphenyls (PCB) testing resulted in negligible or undetectable amounts of PCB being present in fish, human milk, water. Higher mercury and PCB concentrations are found in river bottom dirt. Pollution at tourist sites, including Lake Biwa, was examined with respect to water quality, noise, and vehicular problems (traffic and CO). Of the 1053 pollution-related complaints for 1973, more than half of the complaints were due to noise or malodor. Cottage industries were named in about a third of the complaints. Tables of pollution-related subsidies and loans are included.

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81735	81736	81737	81738	81739									